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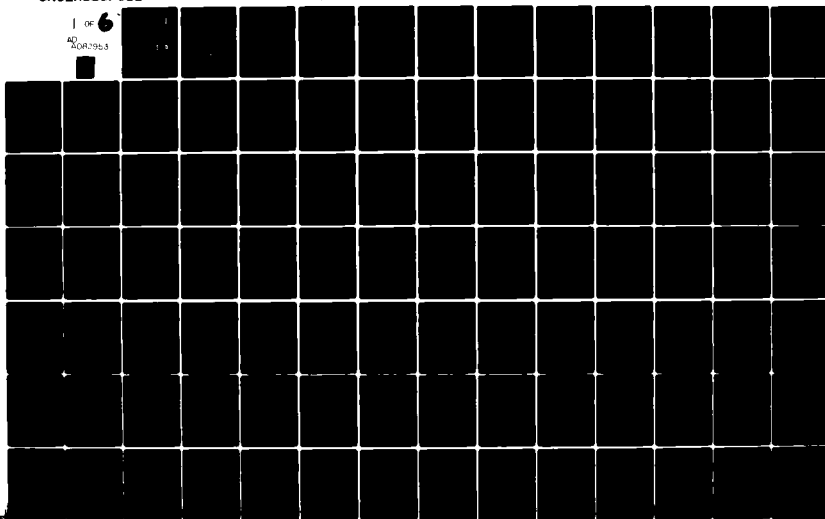
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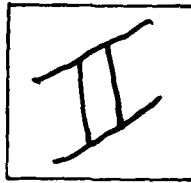
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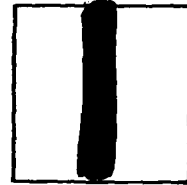
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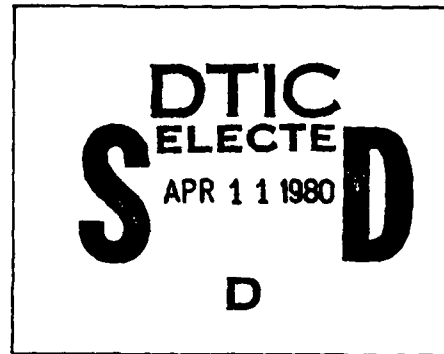
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SURVEY OF ARMY WEAPONS TRAINING AND WEAPONS TRAINING DEVICES

Michael R. McCluskey, Donald F. Haggard, and
Theodore R. Powers
Human Resources Research Organization

UNIT TRAINING AND EVALUATION SYSTEMS TECHNICAL AREA



U. S. Army

Research Institute for the Behavioral and Social Sciences

April 1976

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SURVEY OF ARMY WEAPONS TRAINING AND
WEAPONS TRAINING DEVICES

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SURVEY OF ARMY WEAPONS TRAINING AND WEAPONS TRAINING DEVICES

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SURVEY OF ARMY WEAPONS TRAINING AND WEAPONS TRAINING DEVICES

INTRODUCTION

The overall goal of the current project is to provide information concerning the most effective and efficient methods of training Army personnel to required levels of proficiency in weapons firing. The examination of training methods will focus on the contribution of training devices and live firing to weapons proficiency.

The present report describes the results of the first phase (Task 1) of the project. This task consisted of surveying current Army weapons training. The basic information collected for the surveys was contributed by numerous groups and agencies at each of the combat arms schools. This interim report summarizes the results of those surveys.

MILITARY PROBLEM

Traditionally, training in the use of military weapons has been conducted by lecture, demonstrations, and practice in live firing the actual weapons on ranges possessing the necessary area requirements. These ranges are generally similar to the environments where the weapons would be used in combat. However, numerous factors place serious constraints on the use of live firing.

For example, the availability of suitable ranges is decreasing. Thus, ranges for the larger missile systems are currently located only in the southwestern section of the United States. Range availability is rapidly decreasing in Europe and the Far East, and stringent limitations are placed on the types of weapons that may be fired because of safety factors and the encroachment of civilian populations.

Furthermore, costs incidental to live firing place constraints on training effectiveness. Costs are incurred in relation to such factors as (1) terrain for ranges; (2) maintenance of ranges, target arrays, and aerial targets; (3) transportation costs and maintenance of prime movers; (4) barrel life on larger weapon systems; (5) ammunition cost, especially when the weapon system may be the ammunition as is the case with missiles; and (6) support personnel associated with target acquisition, communications, safety, and meteorological data.

All of these considerations place serious constraints on the use of live firing in weapons training. Accordingly, efforts are being made to perfect techniques and devices which will enable development of weapons proficiency with a minimum, or at least optimum, use of live firing practice. Dry firing (executing the procedures for live firing without the use of live ammunition), miniature ranges using subcaliber weapons, and various training devices have been partially successful and numerous other training devices and techniques are under development.

The previously mentioned constraints on the use of live firing and the present and potential developments in training devices make it important to know the precise value of live firing to weapons proficiency. It is also important to determine whether required proficiency levels can be achieved through more extensive use of new training techniques and devices, or through substitution, in whole or in part, of the techniques and devices for live firing in weapons training.

RELEVANT LITERATURE

A literature survey revealed numerous studies involved with the use of various simulators and the transfer of training from these devices (Prophet and Boyd, 1970; Grimsley, 1969; Cox, et al; Blaiwes and Regan, 1970; Dougherty, Houston, Nicklas, 1957; Caro, 1970; Isley, 1968; Newton, 1959). Most of these studies, however, examined the effectiveness of aircraft flight simulators for training pilots in certain flight procedures. These studies are related to the current

project only in a general sense, with the possible exception of missile training where tasks are also highly proceduralized.

Another group of investigations which dealt with many of the weapons and training devices included in the present survey (Stearn and Hayek, 1969; Kotras and Harris, 1967; Heatherington, 1972; Brundiek, 1972; Williams, et al; Hayes, 1972; Moline, 1971; Gregory and Tibuni, 1972) were oriented primarily toward engineering and reliability tests of the equipment. These studies, therefore, did not include determinations of the effectiveness of training or training devices, or any information on weapons firing proficiency.

The basic purpose of the literature survey was to identify research that had been done on training methods for weapons training. The interest in training methods was specifically oriented toward determining the effect of various combinations of live firing, dry firing, subcaliber firing, and simulated firing on the end of training proficiency levels. Unfortunately, only a few directly relevant studies were identified.

In 1955, Porter, Baerman, and Reddan investigated the effects of subcaliber firing exercises during training on 90mm tank gunner proficiency. The experiment was conducted with a total of 80 subjects that were randomly assigned to one of two training method groups, a control group (ATT method) and a subcaliber group (experimental method). The normal ten-week training cycle consisted of a nonfiring preliminary phase, a subcaliber firing phase, and a 90mm firing phase. The two groups received exactly the same training during the first two phases. For both groups, each trainee fired 480 rounds during the subcaliber phase, and in the 90mm phase the control group fired 37 rounds of 90mm ammunition and the subcaliber group fired one round of 90mm ammunition and 99 rounds of 30 caliber ammunition from the coaxial machinegun. The criterion test which consisted of twelve rounds of 90mm ammunition was given to both groups. An analysis of the criterion test scores indicated that there were no significant differences between the groups. The results of the test demonstrate that subcaliber firing may be substituted for 90mm firing without reducing gunner proficiency as measured by the criterion test.

Although data were not presented, Titl (1972) suggested that sub-caliber firing and practice with simulators would increase the effectiveness of tank gunnery training. Also related to Armor weapons training, Mierswa (1972) indicated that the Conduct-Of-Fire Trainer (XM41-XM42) for the Shillelagh missile has had a favorable effect on ammunition allocations. It was previously believed that seven missiles per gunner were required for firing proficiency. With the incorporation of the XM41 and XM42 trainers into weapons training, however, an acceptable level of gunner proficiency was achieved with three missiles.

Two studies examined the effectiveness of a laser training device in marksmanship training for the M16. Marshall (1972) reported the results of a study conducted with basic trainees at Fort Jackson. The groups consisted of (1) a control group, (2) a group firing ball ammunition followed by laser firing, (3) a group firing the laser followed by ball ammunition firing, and (4) a group firing all laser. Basic Rifle Marksmanship record fire scores were used as the criterion, and the mean number of hits for the four groups in the order listed above was 54.3, 56.0, 54.5, and 54.4. Although the details of the study were not provided, it was concluded that in all cases groups using the laser did as well or better than the group using all live fire. Although the differences were small, the data also seemed to suggest that there may be some order effects when trainees fire both laser and live ammunition.

The second study of the laser training device was conducted by HumRRO Division No. 4 at Fort Benning (unpublished). Four groups of subjects were randomly selected from Basic Combat Training companies undergoing the field firing portion of Basic Rifle Marksmanship. The ten field firing exercises conducted in Basic Rifle Marksmanship occur in Periods 7 - 12 and 14 - 17. The experimental groups either fired all ball ammunition, all laser, half ball and half laser, or half laser and half ball. All laser firing was conducted in Periods 7 - 12. Record fire scores were used as the criteria for evaluating the effectiveness of the laser training device. It was found that the scores obtained on Record Fire I and II were not significantly increased or

decreased by substituting firing with the laser training device for either 50 percent or 100 percent of the ball ammunition firing. The range of the mean scores for all four groups was 52.80 to 54.79. Also, the order of presentation of laser and ball firing in the 50 percent condition did not have a significant effect on record fire scores.

The only other study found which was related to the basic problem of determining the optimum mix of various training methods in weapons training was conducted by Norris (1971). The purpose of this study was to evaluate the effectiveness of the Redeye Launch Simulator (RELS) as a training device. The RELS permits the trainee to perform all of the tasks in the engagement sequence, and most of the launch effects of an actual missile are simulated when the trainee fires. Since the sample size for this study was extremely small, the data can only be used to indicate possible trends. During the firing test, four students who fired the RELS prior to Redeye firing made no performance errors in the live firing, but errors were observed in the performance of three other gunners who did not fire the RELS.

Only a few of the studies described above are considered adequate experimental evaluations of methods of providing weapons training with respect to the proportions of subcaliber firing, simulated firing, and live firing. It does appear, however, that a substantial percentage of subcaliber or simulated firing may be substituted for live firing without reducing end of course gunner proficiency levels.

OBJECTIVE

The basic objective of Task 1 was to complete a survey of weapons training and associated training devices for all Army weapons in the inventory. A relatively brief survey was completed for twenty-nine weapon systems and eight of the weapons were examined in detail. The weapon systems included in the survey are presented in Table 1.

Table 1

Weapon Systems Included In The Survey

INFANTRY	FIELD ARTILLERY
Small Arms	Guns
.45 Cal Pistol, M1911A1	M101A1, 105mm
M16A1 Rifle	*M109, 155mm
M203 Grenade Launcher	M107, 175mm
M60 Machinegun	*M110, 8 Inch
.50 Cal Machinegun	
	Missiles
Mortars	Honest John
*81mm	Lance
4.2 Inch	Sergeant
	Pershing
Antitank	
90mm Recoilless Rifle	AIR DEFENSE
106mm Recoilless Rifle	Guns
M72A2, LAW	
*TOW	M42 Duster
	Vulcan
ARMOR	Missiles
*M60A1 Tank	Hawk
*M60A2 Tank	Hercules
M551 AR/AAV	*Redeye
M139, 20mm Gun	*Chaparral

*Weapon systems selected for detailed analysis.

The surveys of weapons training were expected to produce the following types of information:

1. A description of current weapons training in terms of the total system.
2. The degree of utilization of training devices, live fire, simulated fire, and dry fire in weapons training.
3. Areas where either new devices might be developed or the utilization of current devices might be changed.

SCOPE OF SURVEYS

For all surveys, weapons training was defined as those activities and functions directly related to preparing a weapon for firing and engaging an enemy target. It was further assumed that an enemy target had been detected moving to a specific location, and radar and target acquisition groups would not be required. Forward observers, however, would be required to perform all tasks associated with the position (the forward observer, fire direction center, and gun crew were considered to be an integrated group with each component having an equal impact on the effectiveness of an indirect fire weapon system). Therefore, the engagement sequence was started with an acquired target, and training for subsequent tasks was included in the surveys. In the case of aerial targets, it was further assumed that the target had been positively identified as an enemy target. Tactics, employment of the system, maintenance, communication, supply, and other support functions were not considered to be a part of weapons training. It was assumed that all equipment and systems were in satisfactory operating condition.

The weapons selected for analysis represent the primary weapon systems in the inventory. In some cases, a single weapon may have been selected to represent a family of weapons or variations of a basic system. For example, the M79 was included in the M203 grenade launcher, and the M60 and .50 cal machineguns were intended to

represent most of the weapons mounted on personnel carriers or tanks. Weapon systems under development or special purpose weapons such as flamethrowers and Claymore mines were not included in the surveys.

For the brief surveys of all weapons, each level of training (BCT, AIT, OBC, NCOES, and UT) was considered because a trainee must progress through several levels to become completely proficient with a given weapon system. The detailed surveys for the eight weapon systems were limited to AIT since the majority of the weapons training occurs during this instruction.

PROCEDURE

The majority of the information collected for the surveys was obtained with questionnaires. These questionnaires were mailed or personally distributed to the appropriate departments and agencies at each of the combat arms schools. The data obtained from the questionnaires were supplemented by interviews with trainers and training managers, observations of weapons training, and various types of training literature.

The type of information collected for each of the twenty-nine weapons was as follows:

1. Instructional methods used.
2. Amount of live, dry, and simulated fire during practical exercises.
3. Instructional media used.
4. Training management considerations.
5. End of course proficiency measurement.
 - a. Criteria used.
 - b. Type of evaluation.
 - c. Number of trials or rounds used to evaluate firing proficiency.
6. Army Training Tests (ATT).
 - a. Criteria used.
 - b. Number of trials or rounds used to evaluate firing proficiency.

7. Operational Readiness Training Tests (ORTT).
 - a. Criteria used.
 - b. Number of trials or rounds used to evaluate firing proficiency.
8. Facilities and fiscal support required for training.
 - a. Weapon cost.
 - b. Ammunition cost.
 - c. Size of range required.
 - d. Support personnel required.
 - e. Troop transportation costs.
9. Training devices used.
 - a. Title and nomenclature.
 - b. Description of device.
 - c. Amount of utilization of device.
 - d. Skills, functions, decision processes, or computational procedures practiced with device.
 - e. Training methods used during firing practice.
 - f. Costs associated with device.

Most of the information listed above was fairly easy to locate in the appropriate POIs and Army Subject Schedules. Since these reference materials were used to obtain the majority of the information for the brief surveys, the resulting summaries and totals generally represent an entire course of instruction.

The analysis for most of the detailed surveys was conducted with individual lesson plans. Examination of materials at this level provided information on each period of instruction. In order to determine exactly how the training is conducted, however, it would be necessary to observe a representative sample of classes and interview the instructors. Unfortunately, the latter approach was beyond the scope of this phase of the project. The eight detailed surveys did, however, result in a great deal of useful information. These surveys emphasized practical exercises and the exact manner in which they were conducted. This information was considered essential for the following reasons:

1. A detailed examination of each practical exercise provides an indication of the amount and type of training each trainee receives.
2. This level of description permits an analysis of the current utilization of training devices and an identification of areas where other devices might be developed to increase certain skills.
3. Problems with the current training program or its management are more likely to be identified during a detailed analysis of this method of instruction.
4. A detailed examination of the practical exercises provides information which is essential for the design of the field test.

An outline of the information obtained for each of the detailed surveys is presented below:

1. Introduction.
 - a. Description of Weapon System.
 - b. Tactical Mission.
 - c. Current Army Organization of Weapons and Personnel.
 - d. Tactical Employment.
2. Training Content.
 - a. Task Analysis Procedures.
 - b. Utilization of Mission Profiles.
 - c. Amount of Training Required For Proficiency.
3. Training Methods.
 - a. Detailed Description of Practical Exercises.
4. Proficiency Measurement (End of Course Evaluation).
 - a. Performance Measures.
 - b. Performance Standards.
 - c. Validity of Performance Measures.

DISCUSSION OF WEAPONS TRAINING SURVEYS

In order to examine the entire training system, all levels of training were considered during the surveys. Across all the combat arms branches, there was a fairly consistent absence of information at the unit training level. This information was not readily available primarily because unit training has been decentralized. In order to obtain complete information on unit training, it would be necessary to survey a fairly large sample of units since each unit conducts training according to its own individual requirements and situations. It was possible, however, to identify certain types of information which were relatively common or consistent across all units. The majority of the data collected for unit training was information concerned with ATTs, ORTTs, and annual ammunition allocations.

Many of the crew-served weapons included in the survey created a slight problem with respect to the organization of weapons training. The training and evaluation for most direct fire crew-served weapons (tanks, Vulcan, Chaparral, etc.) involve the weapon and its immediate vicinity. The commander, gunner, and assistant gunner may be supported by other members of the crew (ammunition handler, supply, etc.), but as a group they are in close coordination and in total control of the weapon system. For indirect fire weapons (artillery, mortars), however, the effectiveness of the weapon depends on three separate elements of the fire team: the gun crew, the fire direction center, and the forward observer. Since these elements are extremely interdependent, it was felt that they should all be included in the survey of weapons training.

Another basic question concerning the surveys was whether or not weapons training should be described as it is programmed or as it is actually conducted. Emphasis was placed on collecting data which would describe training as it is actually conducted because it was felt that this information would be more useful in identifying problems or weaknesses in the training or training management. As was mentioned

previously, an extremely detailed examination of training is required in order to determine how it is actually conducted. This level of detail was achieved only in certain sections of the eight detailed surveys. The brief surveys for all weapons generally describe training as it is programmed and scheduled in the POIs and Subject Schedules.

The data collected for all twenty-nine weapon systems and also the eight detailed surveys are presented in Appendices A-H. There are numerous blanks which appear as missing data in the tables. This lack of information occurred for a variety of reasons. In some cases, a particular level of training may not have been appropriate for a specific weapon system. For example, weapons training for the Redeye is not given in Basic Combat Training and therefore information would not appear in this column. In other cases, the questionnaires may not have been routed to the appropriate individuals for completion. When this occurred, the respondent generally provided the information in his area of responsibility and returned the questionnaire. Other types of information requested required a great deal of time to develop. It was not expected that all agencies and departments would be able to divert sufficient resources to provide this type of information.

The data collected for all surveys came from a wide variety of sources. Since quality control was not possible, it is not known to what extent these data accurately reflect current weapons training. In general, it appears that the data can certainly be used to indicate trends at a fairly detailed level with a reasonable degree of accuracy.

The following sections provide summaries for each of the combat arms branches. These summaries were developed using the material contained in the Appendices. Information collected for the brief surveys was placed in table form for the areas of training methods and media, types of practical exercises, end of course proficiency measurement, and utilization of training devices. With respect to the detailed surveys, the most significant findings and observations were summarized from the training descriptions in the Appendices.

The summaries for a given weapon system were developed by summing or adding information across appropriate levels of training. For example, if an individual received 40 hours of weapons training with the M16 in BCT, 20 hours in AIT, and 55 hours in unit training, then a total of 115 hours devoted to M16 weapons training would be listed in the overall summary table. Information was summarized in this manner for NCO training, officer training, or specific duty positions in some cases. Therefore, the summaries provided in the following sections may be regarded as an overview of weapons training for a specific system.

The summaries are fairly general and should be regarded only as approximations since many types of information and measures are not entirely appropriate for addition across levels of training. The summaries do provide, however, a general indication of the amount and type of training required to reach maximum levels of proficiency with a given weapon system on an individual and tactical unit basis. It should be pointed out that the majority of information collected in the surveys was obtained at the AIT level. Therefore, the overall summaries are primarily a reflection of individual weapons training.

INFANTRY WEAPONS TRAINING

The methods and media utilized in Infantry weapons training are presented in Table 2. It may be seen that the majority of this training is conducted with practical exercises and the hands-on approach to training. The percentages for these methods are supported by the selection of the actual equipment as the primary training media. Except for antitank weapons, there is very little utilization of training devices in Infantry weapons training.

Table 3 indicates that proficiency with Infantry weapons is achieved primarily through the use of live ammunition. The antitank weapons are the exceptions probably due to the cost of the ammunition. The training for these weapons relies heavily on the use of simulated and subcaliber fire.

Table 2

Methods and Media For Infantry Weapons Training

Instructional Method	Total Hours of Instruction With Various Methods and Media										
	Small Arms					Mortars		Antitank			
	.45 pistol	M16A1	M203 GL	M60 MG	.50 cal MG	81mm	4.2 Inch	90mm	106mm	M72A2	TOW
Conference	.2	2.8	.7	1.5	.3	3.2	.4	.8	1.6	.3	2.5
Demonstration	.2	10	.8	6	1.2	13.6	1.3	2.3	6.5	.1	6.5
Practical Exercise	3	117.9	76.2	95	4.5	93.2	5.8	80	96.9	1.9	19
Hands-On		27.9	.9	2.5						74.7	
Peer Instruction	.6	13.8	1.4	5	1	63	4.5	1.9	4	1	5
Instructional Media											
Training Device		4				3		5	14.5	1.3	16
Still Pictures			.9	.6	.2	1	1	.5	.5		1
Actual Equipment	3.8	90.7	6.4	36.1	5.3	102.5	10.6	7.5	22	4.5	16
Instructor	.2	4.7	.7	1.3	.5	1.5	.4			.1	

Firing Practice For Infantry Weapons Training

[illegible]

The training devices for antitank weapons appear to be adequate for allowing the trainee to practice the skills involved in target acquisition, sight alignment, tracking, and firing. These systems also provide the trainee with the appropriate knowledge of results concerning firing performance. One possible limitation of these devices is the absence of some launch effects associated with firing a live round. If launch effects interact with other skills being trained (sight alignment, tracking, etc.), then proficiency in firing antitank weapons probably could not be achieved with the number of live rounds indicated.

The TOW trainer (XM70) contains a blast simulator diaphragm which is intended to duplicate some of the launch effects. The relationship between firing proficiency and the use of the blast simulator diaphragm, however, is not known. If the device is effective in acclimating the trainee to launch effects, it would facilitate the transition to live firing and maximize the effectiveness of the small number of live rounds that are available for training.

Although not reflected in Table 3, discussions with AIT instructors at Fort Polk indicated that the pneumatic mortar trainer (M32) is used in the 81mm mortar training. The device is currently used for a small part of the training for forward observers. It appears that the utilization of this device could be increased to include exercises for the gun crew, the FDC, and integrated exercises for all three elements of the fire team.

Although several training devices are currently under development for small-arms training, these devices were not included in the surveys. The laser training devices appear to have a great deal of potential for small-arms training. These devices allow the trainee to practice basic marksmanship skills such as sight alignment and re-laying without introducing the confounding variables of recoil, noise, and smoke. The devices also include an excellent feedback system for providing the trainee with knowledge of results. If these devices were used for the acquisition of basic marksmanship skills prior to field firing, ammunition allocations could probably be reduced or at least the maximum benefit would be obtained from the existing allocations.

Table 4 illustrates the type of evaluation, criterion measure and methods of evaluating firing proficiency that are used in determining end of course proficiency levels. The determination of proficiency with Infantry weapons is based almost entirely on actual performance situations. This observation is supported by the high percentages associated with hands-on the actual equipment, crew drills, and integrated tests of the terminal performance requirements. Assuming that the questionnaire completely communicated to the respondents, the performance evaluation appears to be based entirely on whether or not the trainee achieves a specific criterion level. This suggests that specific behavioral objectives have been developed for the instruction and that the criterion levels have been derived from the performance standards in these objectives. In the evaluation

Table 4

Proficiency Measurement For Infantry Weapons Training

End of Course Proficiency Measurement	Percent of Total Evaluation										
	Small Arms					Mortars		Antitank			
	.45 Pistol	M16A1	M203 GL	M60 MG	.50 Cal MG	81mm	4.2 Inch	90mm	106mm	M72A2	TOW
Type of Evaluation											
Paper & Pencil											10
Hands-On, Part Task	100	40	50	80	100				40	100	10
Training Devices											40
Crew Drill, Gunner's Test						100		40			40
Integrated Test of Performance Requirement			20				100				
Qualification		60	30	20				60	60		
Type of Criterion	Percent of Total Evaluation										
Go/No Go Curve	100	100	100	100	100	100		100	100	100	100
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee										
Live Fire		152	12	190							
Simulated Fire											3 hrs.
Blank Fire				11							
Subcaliber								84	100		

of firing proficiency, small arms is the only area where the actual terminal performance requirement (live firing) is evaluated. Proficiency with antitank weapons is evaluated through the use of simulated and subcaliber fire.

The training devices used in Infantry weapons training are listed in Table 5. There are no training devices listed for small arms because the current training programs do not use any devices specifically related to weapons training. Laser training devices which may be used with most small arms are currently under development, but the degree of utilization in existing training programs has not been determined. The pneumatic mortar trainer is used for only a small portion of the 81mm mortar training. The utilization of this trainer is presently limited to demonstration and part of the training for forward observers. The training for antitank weapons includes a relatively high percentage (40%-70%) of sub-caliber firing for firing practice. Dry firing is the other primary training method used to practice firing, and live firing for antitank weapons is minimized.

Under the training management considerations portion of the questionnaire, a summary of the training for all Infantry weapons indicated that the time allocated for evaluation was a substantial percentage of the total course. In many cases, the number of hours scheduled for evaluation was 20-25 percent of the total with the remainder of the time being allocated for training. This is probably an indication of the increased emphasis on performance based evaluations which require more time. Also, these evaluation hours probably include additional training in the form of critique and repetitions of certain exercises.

Table 5

Utilization of Training Devices in Infantry Weapons Training

	Training Devices					
	M32 Pneumatic Mortar Trainer	XM190 Subcaliber Tube	XM190 Subcaliber Tube	M49A1 Subcaliber Gun	M9 Subcaliber Device	XM70 Low Training Set
Level of Training	AIT	BCT	AIT	AIT	AIT	AIT
Weapon System	81mm Mortar	M72A2	M72A2	90mm RR	106mm RR	TOW
Total Hours of Instruction	108	4	2	13	37	33
Total Hours Sched- uled For Train- ing Device	5	1.25	1	6	15	16
Total Hours Each Trainee Uses Device	3.75	.5	10min	3	6	3
Percentage of Total Firing Practice Conducted With The Following:						
Training Device	6%	40%	70%	67%	55%	64%
Live Fire	40%		30%	11%	8%	1%
Dry Fire	54%	60%		22%	37%	35%

81mm Mortar Training. A detailed examination of the practical exercises indicated that 74% of the total practice time was related to crew drills and hands-on the actual equipment, and the remaining 26% was devoted to live firing exercises. Considering only those exercises which provided some type of firing practice, 57% of the total time was considered to be dry fire (crew drill) and 43% live fire.

During this survey, several observations were made concerning various aspects of the 81mm mortar training. With respect to mechanical training, 80 minutes are presently allocated for practical work in mounting and dismounting the mortar, and 80 minutes are scheduled for exercises in placing aiming stakes. It appears that the time required to perform these different tasks was not given sufficient consideration when this time allocation was established. It takes approximately 3 or 4 times as long to mount and dismount the mortar as it does to place aiming stakes. During the practical work for mounting and dismounting, the members of the four-man crew rotate through the positions of gunner and assistant gunner and unless the class is extremely small, each trainee will probably complete the exercise only once. Discussions with several instructors indicated that this limitation will probably cause the trainee difficulty because subsequent periods of instruction assume that the mortar will be properly mounted. Performance on mounting and dismounting the mortar is also a substantial portion of the gunner's examination. Therefore, it appears that the time allocation for this period should be changed to be more consistent with the time required to perform the tasks. It may be necessary to increase the time allocation for this period in order to insure that the basic skills involved in mounting and dismounting the mortar are acquired.

Instructors generally agree that the most difficult aspect of training during the integrated phases of weapons training (gun crew, FDC, and FO) is the FDC portion. For the 81mm mortar, the trainees receive eight hours of training in FDC procedures in Period 16, and an additional ten hours of actual adjustment in Period 18. The

instructors felt that upon completion of the 120-hour course of instruction, the trainees were not qualified to become either FDC computers or FO's without extensive OJT after an assignment to a unit. Under the present unit training program, specific criteria or guidance for additional training are not provided. There appears to be a need to increase the time allocation for FDC training in AIT or establish a specific program for use in unit training.

In Period 17 for the 81mm mortar, the instruction is concerned with techniques of fire without an FDC. The probability of occurrence of a situation which would require the mortar to be fired directly is extremely low. Therefore, it appears that this instructional time and ammunition allocation (three rounds per trainee) could be used to greater advantage in other phases of the training. For example, some of this time could be used to increase the practical work in mounting and dismounting the mortar or for additional FDC instruction. It appears that the direct lay technique could simply be demonstrated using either live ammunition or the pneumatic mortar trainer. If the trainees must acquire new skills in order to use the direct lay technique, the pneumatic mortar trainer could probably be used in these exercises.

The live fire exercise for the 81mm mortar (Period 18) is 30 hours for both day and night firing. This period of instruction usually covers two days (generally consecutive) in the field with trainees divided into three groups. One group serves as the gun crew, one acts as the FDC computer, and the third performs the functions of the forward observer. This is a live fire exercise and the bulk of the ammunition fired is done so in this period of instruction. There is an expenditure of 10.5 rounds per trainee for the two-day exercise, including HE and illuminating rounds for both day and night. The instructors indicated that the difficulty with this period is that the second day is a continuation of the first day, and no new functions are added. They felt that the training value of the second day was questionable due to the reduced levels of trainee motivation probably caused by fatigue and a lack of interest in the repetition.

There are several possibilities for increasing the effectiveness of this period and obtaining maximum benefit from the ammunition expenditure. The MOS qualification is presently based entirely on the gunner's examination. One possibility is to use the second day of firing as a part of the MOS qualification. This would increase the validity of the qualification scores since proficiency on the terminal performance requirement would be included. If the first day were used for practice and the second day for record firing, levels of motivation among the trainees should be substantially increased. Another possibility is to substitute one of these days of live firing for practical exercises with the pneumatic mortar trainer at an earlier point in the course. The present instruction does not include an integrated exercise of all three fire team elements (gun crew, FDC, and FO) with any of the training devices or the actual equipment. It appears that the integrated actions of the three elements should be practiced before live firing. Practical exercises with the pneumatic trainer would not only serve as training but also to isolate certain deficiencies in the functioning of the team. These deficiencies could then be eliminated or reduced with the pneumatic trainer before live firing. If the two live firing days were scheduled several days apart, and additional exercise with the pneumatic trainer could be scheduled between the two live firing days to further increase proficiency.

ARMOR WEAPONS TRAINING

The methods in media utilized in Armor weapons training are presented in Table 6. The hours of instruction and percentages given in this table are summaries of Advanced Individual Training and unit training. Although the majority of the instruction is conducted with practical exercises, the number of instructional hours devoted to conference is much higher than was observed for Infantry weapons training. This increase is probably a function of the knowledge requirements associated with the more complex crew-served weapon systems. The hours of instruction listed for instructor guidance and critique in small groups is primarily a reflection of Armor unit training. Training devices and the actual equipment are the basic media used in the training. In most cases, the training devices are mounted on the actual equipment which should provide an extremely realistic training environment if the visual effects simulators and feedback systems provide the trainee with a high fidelity representation of the critical variables.

Table 7 illustrates the types of practical exercises that are used during firing practice. Excluding the machinegun firing which includes coaxial and antipersonnel guns, the weapons training for the main gun appears to be about 40% live fire and 60% simulated or dry fire. This is difficult to estimate since some of the figures for simulated and dry fire were reported in terms of hours rather than trials per trainee. Since the number of trials per trainee varies with class size and other factors, it was not possible to obtain an accurate figure for the number of trials.

The methods and criteria used for determining end of training weapons proficiency are shown in Table 8. The entries in this table indicate that 70% of the evaluation is conducted with hands-on the actual equipment and specific go/no go criteria are used. The evaluation of firing proficiency is conducted primarily using live ammunition with certain other tasks in the engagement sequence being evaluated with simulated fire.

Table 6

Methods and Media For Armor Weapons Training

Instructional Methods	Total Hours of Instruction With Various Methods			
	M60A1 Tank	M60A2 Tank	M551 AR/AAV	M139 Cannon
Conference	30	18	21.5	2
Demonstration	4	4	5.5	4
Practical Exercise	126	162	129	32
Instructor Guidance and Critique With Small Group	60	80	80	
Instructional Media	Percentage of Course Objectives Achieved With Various Media			
Training Devices	20	30	47	
Transparencies	3	9	8	
Printed Material	6	5	5	3
Television	1			
Motion Pictures	2	2	2	
Actual Equipment	58	48	32	88
Instructor	10	6	6	9

Table 7

Firing Practice For Armor Weapons Training

	Number of Practice Trials or Rounds Per Trainee			
	M60A1 Tank	M60A2 Tank	M551 AR/AAV	M139 Cannon
Live Fire	39	47	40	158
Main Gun				
Machinegun	375	150	275	975
Dry Fire	1 hr	5 hrs	15	15
Simulated Fire	34	4 hrs	28	

Table 8

Proficiency Measurement For Armor Weapons Training

End of Training Proficiency Measurement	Percent of Total Evaluation			
	M60A1 Tank	M60A2 Tank	M551 AR/AAV	M139 Cannon
Type of Evaluation				
Paper & Pencil				
Hands-On, Part Task	70	70	70	100
Training Devices	10	10	10	
Crew Drill, Gun- ner's Test	10	10	10	
Integrated Test of Performance Requirement	10	10	10	
Type of Criterion	Percent of Total Evaluation			
Go/No Go	100	100	100	100
Curve				
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee			
Live Fire				
Main Gun	27	30	25	829
Machinegun	845	986	986	
Dry Fire				
Simulated Fire	17	17	17	

The utilization of training devices in weapons training is shown in Table 9. The majority of the training devices are used in conjunction with the Armor Basic Officer Course. It should be pointed out that this level of training was not included in the previous summaries where the ratio of live fire to simulated or dry fire was estimated to be 40%/60%. In general, this table indicates that only about 15% of the firing practice is conducted with live ammunition and the remainder of the practice is conducted with different amounts of training device time, dry firing, and laser firing. An examination of the total hours scheduled for training devices and the total amount of time each trainee uses the training device indicates that the number of hours scheduled is four or five times larger than the number of hours of utilization per trainee. This is probably a function of both crew exercises where the members rotate to various positions, and the limited number of these relatively expensive devices that are available for a given course.

M60A1 and M60A2 Tank Training. During the detailed examination of practical exercises for the M60A1 tank training, it was found that the training was composed of the following: 20% live fire, 10% dry fire, 57% laser fire, and 13% part task training with the actual equipment. In the present training which has this composition, trainees complete a firing table and continue to the next table whether or not the target has been successfully engaged. The Army had previously determined that 13 rounds of live ammunition against various targets were required for achieving a minimum level of proficiency. Since there is no evidence of any major problems with gunners passing the qualification firing, it appears that the current mix of training methods enables most trainees to reach acceptable levels of proficiency.

Although the training programs for the M60A2 tank are still being developed, the following composition of practical exercises was determined from the proposed AIT program: 36% live fire, 62% laser fire, and 2% with training devices. Based on the composition of practical exercises for other Armor weapons training programs, the proposed mix should enable trainees to achieve the required performance standards.

Table 9

Utilization of Training Devices In Armor Weapons Training

	Training Devices								
	XM55 Laser Tank Gunnery Trainer	M42, Target Conduct of Fire Trainer	M60A1 Tank Turret Trainer	Trainer Launch-er Conduct of Fire	Turret Trainer M37	XM40 Turret Trainer	Trainer Launch-er Conduct of Fire	Conduct of Fire Trainer (BOT)	M41/42 Conduct of Fire Trainer
Level of Training	AIT/OBC	UT/OBC	OBC	OBC	OBC	OBC	OBC	OBC	UT
Weapon System	M60A1/M551	M60A2, M551	M60A1	M60A2	M60A2	M551	M551	M551	M551
Total Hours of Instruction			63	68		6	4	4	18
Total Hours Scheduled For Training Device	6/4	8/2	20	68	72	3	2	1	18
Total Hours Each Trainee Uses Device	6/1	4/1	18		8	1.5	1	1	6
Percentage of Total Firing Practice Conducted With The Following:									
Training Device	60/20	100	30	100	100	80	100	40	95
Live Firing	40/-		50			20		20	5
Dry Firing	-/20		5						
Laser Firing	-/60		15					40	

After obtaining feedback from the initial classes, however, it may be necessary to make some alternations in this composition.

Numerous training devices are presently used in Armor weapons training. These devices appear to provide a valid training environment for practicing critical skills, and their use has been maximized in the existing training programs. The POIs have been modified recently, however, to include stablized gunnery which creates a completely different firing environment. Several exercises have been included which require the firing of the main gun from a moving tank in the stablized mode at both stationary and moving targets. This is an extremely complex firing situation and may be a potential area for the development of new training devices. Before considering this a potential area for device development, however, the stablized gunnery performance requirements should be completely analyzed to determine skill and knowledge requirements with particular emphasis on the visual environment, relevant visual cues, judgments required, and any other new dimensions introduced. After such an analysis, it would then be possible to determine whether or not a cost-effective training device could be developed.

FIELD ARTILLERY WEAPONS TRAINING

Summaries of the methods and media used in Field Artillery weapons training are presented in Table 10. Although practical exercises are the primary method of instruction, the percentage of the instruction conducted with lectures and conferences is quite high. This is probably a function of the complexity of these large crew-served weapons as was noted previously with some of the Armor weapons. In order to function effectively as a member of a crew, the trainee must acquire a great deal of knowledge in addition to development of the necessary skills. This is particularly true in the case of the extremely complex missile systems. The instructor and the actual equipment serve as the primary media for this training. The relatively large number of hours listed for field trips indicates time spent on the ranges either observing demonstrations or completing practical exercises.

Table 10

Methods and Media For Field Artillery Weapons Training

Instructional Method	Total Hours of Instruction With Various Methods and Media									
	Cannons				FDC	FO	Missiles			
	105mm	155mm	175mm	8 Inch			Honest John	Lance	Sergeant	Pershing
Lecture	17	1	1	1	19	3	2	15	5	9
Conference	43	28	23	30	84	15	92	98	126	116
Demonstration	14	$\frac{1}{2}$	$\frac{1}{2}$	2	27	9	12	10	16	19
Practical Exercise	199	109	37	50	272	86	122	395	276	503
Peer Instruction										90
Instructor Guidance & Critique With Small Group	26	5	4	4			18	24		
Review	1	2	$\frac{1}{2}$	$\frac{1}{2}$						
Programmed Instruction	7								8	20
Instructional Media										
Field Trips	17	8	8	8	50	58	21	9	12	
Training Devices	8					8	6	52	47	24
Transparencies							1	15	12	
Printed Material	7						1			
Television	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$		1	13	1	3	22
Motion Pictures	3				3					
Actual Equipment	247	123	49	59	272		105	380	231	466
Instructor	14	18	9	20	86	30	99	74	146	150

Table 11 illustrates the types of practical exercises that are used for firing practice. A high percentage of the ammunition allocated for training with Field Artillery cannons is fired in demonstration. Considering the training value of demonstration firing, this percentage appears to be excessive. Although demonstrations are impressive and motivating, the number of rounds used for this purpose probably could be reduced. There are also tremendous ammunition expenditures for Firepower demonstrations which occur two or three times a year. If demonstrations are considered to be an essential part of Field Artillery weapons training, then it appears that they should be held less frequently with a larger number of trainees observing which would reduce the total ammunition requirement for demonstrations.

Table 11

Firing Practice For Field Artillery Weapons Training

Type of Practical Exercise	Number of Practice Trials or Rounds Per Trainee									
	Cannons				FDC	FO	Missiles			
	105mm	155mm	175mm	8 Inch			Honest John	Lance	Sergeant	Pershing
Live Fire										
Exercise	33	22		2.5	18	42				
Demonstration	100	104	3	6						
Blank Fire										
Dry Fire									105.4*	
Subcaliber Fire	22					17				
Simulated Fire							45*	96.7*	117*	230*

*Hours

For most trainees, the large majority of the live firing practice is conducted with the 105mm. Except for 1.5 rounds, the ammunition expenditure indicated for the 155mm occurs when the trainee has advanced to the NCO Basic Course. In AIT when the gun crew receives the basic training for all cannons, the 105mm is used in almost all of the practical exercises and the other cannons are simply demonstrated. Although the trainee receives mechanical and hands-on training with all systems, live firing practice is conducted only with the 105mm (except for 1.5 rounds of 155mm ammunition per student). Due to the extreme costs involved, instruction for the missiles is conducted entirely with hands-on training and simulated firing.

The methods of measuring proficiency with Field Artillery weapons are listed in Table 12. About 50% of the end of course evaluation for Field Artillery weapons is conducted with paper-and-pencil tests. The use of this type of evaluation is a reflection of the extensive knowledge requirements associated with these weapons. The remainder of the evaluation consists of crew exercises, part task evaluations, and dry firing. It should be pointed out that no live fire ammunition is used in determining end of course proficiency levels for any of the Field Artillery weapon systems. It appears that this is one area where the 14.5mm subcaliber device could be used to provide a proficiency evaluation that is performance based. Although it may be possible to obtain an adequate evaluation of gun crew proficiency in a dry firing situation, it seems that an evaluation of FO procedures, and possibly FDC activities, would be more appropriate in an actual performance situation, even though reduced in scale.

The utilization of training devices in Field Artillery weapons training is shown in Table 13. The vast majority of the training devices are used for missile training. These devices vary from functional mock-ups to pieces of the actual equipment that have been modified to provide feedback to the trainee or information which may be monitored by the instructor. In missile training, the combination

Table 12

Proficiency Measurement For Field Artillery Weapons Training

End of Course Proficiency Measurement	Percent of Total Evaluation									
	Cannons				FDC	FO	Missiles			
	105mm	155mm	175mm	8 Inch			Honest John	Lance	Sergeant	Pershing
Type of Evaluation										
Paper and Pencil	47	52	93	96	53		52	50	51	65
Hands-On, Part Task	33	23	7	4	47		24	8	26	19
Training Devices								8	3	
Crew Drill, Gun- ner's Test										
Integrated Test of Performance Requirement	20	25				100	24	34	20	
Equipment and Training Devices										16
Type of Criterion										
Go No Go	50	50	7	28	90	100	50	50	40	35
Curve	50	50	93	72	10		50	50	60	65

Table 13

Utilization of Training Devices In Field Artillery Weapons Training

	Training Devices							
	M31 Trainer (14.5mm)	M31 Rocket and M50	M6 Main Assemblage	M33 Control Surfaces	3G52 Missile Training Set	3G100 Missile Firing Set	XM61 Missile Trainer	XM95E1 Warhead Trainer
Level of Training	OBC	AIT	AIT	AIT	AIT	AIT	AIT	AIT
Weapon System	All Cannons	Honest John	Lance	Lance	SGT	SGT	Pershing	Pershing
Total Hours of Instruction	8.4	180	204	204	142	142		54
Total Hours Sched- uled For Train- ing Device	5.6	102	110	110	94	8	121	54
Total Hours Each Trainee Uses Device	1.7	102	110	110	55	8	121	20
Percentage of Total Firing Practice Conducted With The Following:								
Training Device	18	100	100	100	100	100	100	100
Live Fire	82							
Dry Fire								

of actual equipment and training devices provides an extremely realistic training environment for acquiring all necessary skills. If sufficient quantities of the actual equipment are available for training purposes, then this learning environment should be maintained. If this commitment of actual equipment interferes with other requirements, however, numerous studies have shown that many of the highly proceduralized tasks associated with missile systems may be learned equally well with low fidelity simulations of the equipment.

With respect to cannon training, only one training device is presently being used. This is the 14.5mm subcaliber device which may be used with all cannons. The device is presently used for relatively small portions of the training for the 105mm and FO procedures for NCOs and officers. The 14.5mm subcaliber device is not utilized in practical exercises for any of the other levels of training examined. It appears that the utilization of this device could be increased for all levels of training, particularly AIT, to provide performance based instruction for the gun crew, FDC, and FO. The Field Artillery School is currently in the process of developing permanent ranges for the 14.5 subcaliber device. It was not determined to what extent the device will be used in various course of instruction.

The overall weapons training for Field Artillery systems is apparently conducted in three relatively separate areas: gun crew training (MOS 13A), Fire Direction Center training (MOS 13E) and forward observer training (Officer Basic Course). Since these three elements of the fire team must eventually function together as an integrated team, it appears that the training might be more effective if there were more coordination between these areas of instruction. The integration of training for the fire team elements would probably result in a reduction of ammunition requirements since trainees from each element would obtain the training benefit of each round. If the ammunition allocation for training is presently considered to be too small, then the pooling of ammunition allocations for integrated training would increase the number of rounds available for each trainee.

AIR DEFENSE WEAPONS TRAINING

All of the summaries for Air Defense weapons training primarily indicate the training given in AIT since almost all of the information collected was at this level. Table 14 presents the various methods and media that are currently used in Air Defense weapons training. Practical exercises serve as the primary method of instruction for all weapon systems. This is consistent with the large number of hours which were indicated for the actual equipment as the training media.

It should be pointed out that the instructional hours listed in this table are primarily related to weapons training as defined earlier. The entire Chaparral course, for example, is 280 hours but only 33 of those hours were considered to be directly relevant to weapons training.

Table 15 illustrates that practical work with gun systems is conducted with live ammunition whereas the practical exercises for the missile systems are basically simulated or dry fire. The live ammunition indicated for the Redeye and Chaparral are fired by the students obtaining the highest scores in each class. Therefore, they serve primarily as demonstration rounds for the other class members and have very little training value.

The methods of measuring end of course proficiency are listed in Table 16. Although all evaluations are made in terms of specific behavioral criteria, the particular type of evaluation varies with each weapon. The percentages listed for hands-on equipment, crew drills, and integrated tests indicate that most of the evaluations probably involve performance situations with the actual equipment.

Table 17 outlines the utilization of some of the training devices for Air Defense weapons training. Although other training devices for the Hawk and Hercules were included in the surveys, specific information concerning their utilization was not given because of variations in class size and other factors. With respect to Redeye training devices, the M46 field trainer is a high fidelity mock-up of the weapon system without electronics, but the M49 tracking head trainer in

Table 14

Methods and Media For Air Defense Weapons Training

Instructional Method	Total Hours of Instruction With Various Methods and Media					
	Guns		Missiles			
	M42 Duster	Vulcan	Redeye	Chaparral	Hawk	Hercules
Conference	58	56	9	6	15	14
Demonstration			1		48	39
Practical Exercise	222	165	31	33*	58	129*
Examination			3			
Performance Tests					33	
Administration		46				
Instructional Media						
Field Trips		3				
Training Devices		28	59	8		
Audio Tape Recordings		1				
Still Pictures	30					
Motion Pictures			26**		11	10
Actual Equipment	250	235	2***	31	106	172

*Peer instruction during most of practical exercise

**MTS trainer

*Range firing

Table 15

Firing Practice For Air Defense Weapons Training

Type of Practical Exercise	Number of Practice Trials or Rounds Per Trainee					
	Guns		Missiles			
	M42 Duster	Vulcan	Redeye	Chaparral	Hawk	Hercules
Live Fire	32	620	2*	1*		
Simulated Fire			156	16		
Dry Fire				6		

*Rounds per class

Table 16

Proficiency Measurement For Air Defense Weapons Training

End of Course Proficiency Measurement	Percent of Total Evaluation					
	Guns		Missiles			
	M42 Duster	Vulcan	Redeye	Chaparral	Hawk	Hercules
Type of Evaluation						
Paper & Pencil			60			
Hands-On, Part Task	40			100		100
Training Devices			40			
Crew Drill, Gunner's Test	60				40	
Integrated Test of Performance Requirement		100			60	
Type of Criterion	Percent of Total Evaluation					
Go/No Go	100	100	100	100	100	100
Curve						

Table 17

Utilization of Training Devices In Air Defense Weapons Training

	Training Devices			
	M87 Moving Target Simulator	M46 Field Trainer	M49 Track- ing Trainer	M30 Train- ing Missile
Level of Training	MOS suffix R6	MOS suffix R6	MOS suffix R6	AIT
Weapon System	Redeye	Redeye	Redeye	Chaparral
Total Hours of Instruction	83	83	83	280
Total Hours Sched- uled For Train- ing Device	30	2	31	8
Total Hours Each Trainee Uses Device	4	25 min.	6	2
Percentage of Total Firing Practice Conducted With The Following:				
Training Device	100	100	100	20
Live Fire				5
Dry Fire				
Crew Drill				75

conjunction with the M87 moving target simulator (MTS) or some other infrared source permits the trainee to practice all of the skills required for firing an actual Redeye. Each Redeye trainee receives a total of 4 hours of simulated firing practice with the MTS. In the Chaparral training, the M30 training missile is used with the actual equipment to provide the trainees with practice in preparing the weapon for firing, target acquisition, target tracking, and simulated firing.

Redeye Training. Previous engineering and service tests for the Redeye indicated that 120 trials of simulated firing and 30 trials of tracking and simulated firing with live aircraft would be required for an acceptable level of gunner proficiency. The number of trials in the current Redeye training program is based on this figure. All students receive 156 trials on the moving target simulator. In addition, they also serve as the coach for another 156 trials, and observe other students during the remainder of the period. Training with the moving target simulator is currently given in the second and third weeks of the three-week course. Until recently, trainees also received at least 30 tracking trials with live aircraft, but this requirement has been eliminated due to fuel shortages, and the time has been allocated for additional MTS training. While the instructors feel that the MTS is an outstanding training device and especially good as a lead-in to live tracking, they feel that the trainees are now receiving too much MTS training which is resulting in a loss of interest. During tracking with live aircraft, it was also possible for 25 students to be actively involved in the training as opposed to two students with the MTS.

Although the instructors at Fort Bliss do not feel that a radio-controlled model aircraft would be an appropriate substitute for the live aircraft, it appears that some type of reduced scale target for outdoor use may be required to provide an appropriate distribution and variation of practice. In addition, a radio-controlled model aircraft would provide much more realistic flight paths than a ground or cable-mounted aerial target. The Fort Bliss Redeye instructors also

felt that the Redeye Launch Simulator (RELS) would be a valuable training device because it would permit the trainee to experience the effects of firing a live missile and better prepare him for firing an actual Redeye.

At the end of training, all Redeye gunners are expected to perform all of the steps required in the firing sequence without error. Although two of the films for the moving target simulator contain sections from all of the other training films and could be used for examination purposes, they are not used in the current program. Instructors apparently monitor student progress quite closely and provide additional training trials when necessary to insure that the trainee can perform without error.

Chaparral Training. There are currently two periods of instruction in the Chaparral program that contain practical exercises related to firing practice. The first of these involves the use of the M30 training missile and a radio-controlled model airplane with an infrared source. The trainees are rotated through each of the four crew positions, and they spend approximately two hours in each position. The second period is a practical exercise using the actual equipment in a formal crew drill. During this exercise, each trainee completes six trials in each of the four crew positions.

The performance measures used to evaluate proficiency are go/no go tests administered by peer instructors at various times during the course. For most of the crew duties and procedures, the instructors felt that this was an adequate method of insuring an acceptable level of performance. However, there are presently no standards set for tracking proficiency. In addition, the trainee's ability to determine whether or not a target is within the engagement envelope is evaluated with printed drawings of sight pictures. Present testing practices and standards are not considered adequate for estimating combat proficiency in this critical area.

When trainees are tracking live aircraft or radio-controlled models and making judgments concerning whether or not the target is within the engagement envelope, there is no provision for providing the trainees with knowledge of results concerning their judgments. There appears to be a need, either through instrumentation or the development of training devices, to provide the trainee with a situation where he can use the actual equipment in making these judgments and receive immediate feedback on his accuracy. There are some indications, however, that ranging may not be a performance requirement due to some of the equipment characteristics. The acquisition range of the infrared seeker in the missile is about the same as the range of the missile itself. This suggests that as soon as the gunner obtains the IR tone, he may fire without considering the target's range or the envelope of the system. Before this could be considered to be a potential area for training device development, the above considerations would have to be examined in detail.

OVERVIEW

This section is primarily a summary of the overall results of the surveys. Some items of information which reflected similar findings across the combat arms are also included. Finally, the selection of weapons for Task 2 is discussed.

Training Content. There was no attempt in any of the surveys to describe or evaluate the actual content of weapons training. Several sections were included in the detailed surveys for determining the types of information and procedures used in developing the content of the training. The task analysis procedure used for most of the weapons consisted primarily of the use of conferences or committees for the development of task inventories. This method was generally supplemented to a minor degree by observation, individual interview, and service test descriptions and results. In a few cases, there was no evidence that a formal task analysis had been conducted.

For almost all weapons, there was no indication that mission profiles had been developed or utilized during the development of task inventories. Although CONARC REG 350-100-1 does not specify the use of mission profiles, this procedure will provide a great deal of assistance in identifying relevant job performance requirements. The identification of critical tasks becomes a highly systematic procedure rather than the more subjective committee approach where the distinction between critical and nice-to-know tasks may not be present.

The amount of training required for an acceptable level of gunner proficiency was also surveyed. In most cases, the number of training trials required was derived from initial service tests of the system with some adjustments to incorporate feedback from initial classes. The relationship between the learning curve for a given weapon and the number of training trials presently used is not known.

Training Methods. One of the objectives of Task 1 was to examine current weapons training and identify the proportions of various training methods (live, dry, simulated, etc.) used. This information has been summarized from all surveys and included in Tables 18 and 19. For most Infantry weapons, the composition of the training in terms of percentages for various methods could not be determined. A considerable amount of the firing practice for Infantry weapons is completed with dry firing. Since dry firing practice was reported in hours rather than the number of trials per trainee, percentages could not be computed.

The percentages of different training methods vary considerably according to the particular weapon system. In general, the correlation between ammunition cost and ammunition expenditure appears to be fairly high. As cost increases and expenditure decreases, there is generally an increased utilization of methods other than live firing.

As a substitute for live firing, various types of simulated and dry fire appear to be used more frequently than subcaliber firing. Since each weapon system has its own specific conditions and training objectives, however, the percentages probably should be examined in terms of a specific weapon rather than attempting to summarize across all weapons.

Table 18

MIX OF TRAINING METHODS FOR INFANTRY AND ARMOR WEAPONS TRAINING

WEAPON SYSTEM	BCI					AIT					OBC				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Infantry															
.45 Cal.						50R		1/4H							
M16A1	649		6H	38R		76%			24%						
M203GL	5		1/4H					3H							
M60MG	103		1H			562									
.50 Cal. MG						106		1H							
81mm MOR						40%		54%	6%						
4.2 In MOR						2		3H							
90mm RR						3	91	2H							
106mm RR						8%	55%	37%							
M72A2		40%	60%												
TOW								35%	64%	1%					
Armor															
M60A1						23%		11%	66%		14%			86%	
M60A2						36%			64%					100%	
M551						14%		30%	56%		21%			79%	
M139						91%		9%			100%				

1 - Live Fire
 2 - Subcaliber Fire
 3 - Dry Fire
 4 - Simulated Fire
 5 - Demonstration
 R - Rounds
 H - Hits

Table 19

MIX OF TRAINING METHODS FOR FIELD ARTILLERY AND AIR DEFENSE WEAPONS TRAINING

WEAPON SYSTEM	AIT					OBC					NCOES				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Field Artillery															
105mm	6%	4%			90%	71%	29%				61%	39%			
155mm	9%				91%	100%					19%				81%
175mm					100%										
8 inch					100%						100%				
FDC	100%					100%					100%				
FO	100%					71%	29%					100%			
Honest John									100%					100%	
Lance														100%	
Sergeant				100%					100%					100%	
Pershing				100%					100%					100%	
Air Defense															
M42	100%														
Vulcan	100%														
Redeye				99%	1%										
Chaparral			6%	70%	4%										
Hawk				100%											
Hercules				100%											

- 1 - Live Fire
 2 - Subcaliber Fire
 3 - Dry Fire
 4 - Simulated Fire
 5 - Demonstration

Training Devices. A few areas for potential training device development were identified during the surveys, but equally important was the apparent need to increase the degree of utilization of existing devices. This was particularly true for the pneumatic mortar trainer and the Field Artillery subcaliber device for cannon training. It appears that these devices should be used not only to increase proficiency of fire team elements (gun crew, FDC, and FO), but also for integrated exercises for the entire team. This would provide practice in coordinating the efforts of the team and also increase the efficiency of training through increased student participation.

There are several questions which should be addressed in conjunction with a plan for increased utilization of these devices. It would first be necessary to identify the performance measures which would be used in evaluating the performance of each element of the fire team. It would also be necessary to develop performance measures for the integrated team exercises. These measures should allow the distribution of error among the elements so that specific deficiencies could be identified. Another question is concerned with the transfer relationship between the training devices and the firing of service ammunition. It is not clear how the forward observer's judgments made in a reduced-scale environment will transfer to a full-scale situation. The change in scale may also have some effect on gun crew performance although to a lesser extent.

One area which appears to be a good candidate for training device development is concerned with the launch and blast effects of larger caliber rounds or missiles. This apparent need applies primarily to individual weapons or crew-served weapons where the gunner controls the entire engagement. Examples of these weapons are antitank weapons, Redeye, and possibly mortars. These are all weapons where the crew members are in close proximity to the firing of the round, and the target engagement sequence may be affected by recoil, blast, noise, smoke, or weight changes. If these launch effects influence the attainment of proficiency with a weapon, then there should be some means of providing relevant training without using live ammunition since the weapons under consideration are fairly expensive to fire.

The Redeye Launch Simulator (RELS) which duplicates some of the launch and blast effects of a Redeye firing will be tested in the near future. Also, the Launch Effects Training Simulator (LETS) for the DRAGON is currently undergoing test and evaluation. The tests for both of these devices should assist in determining the feasibility of developing launch simulators for similar weapon systems.

Two other possibilities for potential training device development were identified in Air Defense weapons training. The first of these is a possible requirement for an outdoor reduced-scale target simulator which would allow Redeye trainees to practice all of the functions in the engagement sequence. This may be primarily a management and scheduling problem, however, since the existing Moving Target Simulator (MTS) has the capability of providing all the necessary skill training.

The other possible Air Defense training device requirement is concerned with Chaparral gunner performance requirements. There is presently no method of providing the gunner with immediate feedback on the accuracy of his judgments concerning whether or not the target is within the engagement envelope of the weapon system. This performance requirement may be eliminated, however, during an analysis of the equipment and system capabilities.

The last possibility identified for training device development is related to the stabilized gunnery requirement for Armor Weapons. This requirement creates an extremely complex firing environment which will require thorough analysis before it can be determined whether or not training device development is feasible and potentially cost-effective.

End of Course Proficiency Measurement. The end of course evaluation for Armor weapons and small arms was based on trainee performance on various firing tables. The criterion was generally a go/no performance standard. For Field Artillery weapons, Air Defense missiles, ant tank weapons, and mortars, however, the evaluation of gunner

proficiency was not based on live firing of service ammunition. It was not determined to what extent the established standards are accurate reflections of the levels of proficiency required in combat. It is also not known if the crew drills and subcaliber firings used as proficiency tests are valid and reliable estimates of existing performance standards.

Selection of Weapon Systems For Task 2. It is assumed that the three weapons to be identified for task analysis will be selected from the eight weapons which were surveyed in detail. It appears that the following factors should be given primary consideration in selecting these three weapons which will also include the two weapons to be field tested in Task 3.

1. The weapons should be representative of a family of weapons to permit an identification of task commonalities between similar weapons.
2. The weapons should be available in sufficient numbers for field evaluation.
3. Training devices for weapons training should be available in sufficient numbers and types to develop experimental training programs for the field test.
4. Because of the ammunition requirements for the field test, ammunition cost should be as low as possible.

For Infantry weapons, the 81mm mortar appears to best satisfy the above requirements. This is based primarily on the availability of weapons and crews, and the cost of ammunition. The M60A1 tank appears to be the only possibility for Armor weapons. The M60A2 tanks are not available in sufficient numbers and the training programs are presently under development. With respect to Field Artillery weapons, the 155mm SP appears to be the logical choice based on weapon system availability and ammunition cost. Both of the Air Defense weapon systems fail to satisfy the requirements of representation of a family, availability of training devices, and

ammunition cost. Therefore, it is suggested that the three weapon systems previously mentioned (81mm mortar, M60A1 tank, and 155mm SP) be selected for analysis in Task 2.

BIBLIOGRAPHY

GENERAL

Training

Ammerman, Harry L. and William H. Melching. Man in Control of Highly Automated Systems. Paper presented at Human Factors Research and Development Conference, Fort Bliss, Texas, October 1970. HumKRO Professional Paper 7-71 (MANICON), May 1971.

Arima, James K. Human Factors in Weapon System Evaluation. Technical Paper ISSSL-TP 69-1, Litton Scientific Support Laboratory, Fort Ord, California, March 1969.

Brennan, Mark F. et al. Training Management in Basic Combat Training. Consulting Report, HumKRO Division 3, Presidio of Monterey, California, October 1969 (ATCSYSTEM - FOR INTERNAL USE ONLY).

Bretz, R. The MODIA Questionnaire for Curriculum Analysis. RAND Report R-1020-PR, RAND Corporation, Santa Monica, California, November 1972. (See also Carpenter et al, November 1972.)

Carpenter, M. B. et al. The MODIA Decision Process for Developing Strategies of Air Force Instruction. RAND Report R-1019-PR, RAND Corporation, Santa Monica, California, November 1972. (See also Bretz, November 1972.)

Caviness, James A. et al. Target Detection and Range Estimation. HumKRO Technical Report 72-34, November 1972.

Condon, Morris L., H. Walter Thorne, Raymond Rush, and C. Michael York. Study of Bias in New Equipment Training. Report on Project No. 3381, US Army Infantry Board, Fort Benning, Georgia, 30 April 1973.

Cox, John A. Application of a Method of Evaluating Training, Journal of Applied Psychology, April 1969, vol. 48, no. 2 (TRADER 1) "... includes estimates of proficiency level attained, worth of a trained man in dollars, and training costs in dollars. ..." HumKRO Division 5 (TRADER).

Department of the Army. AR 350-1. Army Training. Army Regulation, 3 November 1971, with Change 1.

Department of the Army. AR 350-4. Qualification and Familiarization with Weapons and Weapon Systems. Army Regulation, 25 September 1972.

GENERAL Training (Cont'd)

Department of the Army. ATP 9-17. Ordnance Ammunition Support Units. Army Training Program, 26 December 1968.

Department of the Army. ATP 21-114. Male Military Personnel without Prior Service. Army Training Program, 9 April 1970.

Department of the Army. ASubjSed 9-1. Practical Application Ammunition Command and Operations Personnel. Army Subject Schedule, 30 July 1968.

Department of the Army. ASubjSed 9-12. Conventional Ammunition Support Operations. Army Subject Schedule, 16 October 1968.

Department of the Army. ASubjSed 23-74. Familiarization with U. S. Weapons. Army Subject Schedule, 8 April 1970.

Department of the Army. FM 9-19. Conventional Ammunition Maintenance Unit Operations. Field Manual, 16 July 1970.

Department of the Army. FM 9-38. Conventional Ammunition Unit Operations. Field Manual, 16 June 1970.

Department of the Army. FM 9-47. Special Ammunition Unit Operations. Field Manual, 12 October 1970.

Gschwind, Robert T. A Preliminary Report on Gunner Tracking Behavior. Technical Note 6-62, Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, December 1962.

Gschwind, Robert T. Gunner Tracking Behavior as a Function of Three Different Control Systems. Technical Memorandum 2-63, Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, January 1963.

Harker, George S. Military Operations, Human Capacities, and Equipment Compromises. Advance paper prepared for discussion in Panel II, Human Engineering, Man--Mobility--Survivability Forum, Indianapolis, Indiana, 11-12 April 1967.

Picks, Samuel A. Literature Review: Tracking Control Mechanisms and Displays (Light Antiaircraft System Oriented). Technical Memorandum 9-57, Human Engineering Laboratory, Aberdeen Proving Ground, Maryland, December 1957.

Hilton, Richard D. What Every Ground Commander Should Know About Guided Bombs. Army, June 1973, 23(6), 28-33.

GENERAL Training (Cont'd)

Human Engineering Laboratories. Manpower Resources Integration Guide for Army Materiel Development. HEL Guide 1-69, Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, 30 January 1969. (Includes training requirements).

Jacobs, T. O. Training for Modern Combat Operations. In Individual and Small Unit Training for Combat Operations, HumRRO Professional Paper 21-67, May 1967.

Kelly, Henry E. Dangerous Safety. In Henry E. Kelly. The Collected Papers of COL Henry E. Kelly. Fort Benning, Georgia: HumRRO Division 4, compiled 1965, reissued 1966, pp 27-28. (Live firing in the interests of training realism).

Long, James L. Human Factors and Navy Operational Evaluations. Technical Report WTR 73-30, Naval Personnel Research and Development Laboratory, Washington Navy Yard, Washington, D.C., June 1973.

Ludvigsen, Eric C. The Technology Explosion and the Coming Generation of Army Weapons, Equipment, Army, October 1969, 19(10), 147-158 and 162, 164, and 168 -- weapons now in inventory.

Ludvigsen, Eric. Weapons and Equipment: The Outlook for the 70's, Army, October 1970, 121-123, 125, 129, 133, 135, 139, 141, 143, 145-151.

Ludvigsen, Eric C. Army Missiles: A New Generation, Army, June 1973, 23(6), 10-15.

McCluskey, Michael R. et al. Systems Engineering of Training for Eight Combat Arms MOS. HumRRO Technical Report in press, June 1973.

McGuigan, F. J. and Eugene F. MacCaslin. A Comparison of Whole Versus Part Methods of Marksmanship Training. Staff Memorandum, HumRRO Division 2, Fort Knox, Kentucky, May 1954. AD 477 646.

McGuigan, F. J. and Eugene F. MacCaslin. Whole and Part Methods in Learning a Perceptual Motor Skill, American Journal of Psychology, December 1955, 68(4). Paper for annual meeting of Midwestern Psychological Association, Spring 1954.

McIntyre, Francis M. A Technique of Investigating Tank Gunner Tracking Error. Technical Memorandum 20-62, Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, September 1962.

GENERAL Training (Cont'd)

Magner, George J. et al. Interviews on Small Unit Combat Actions in Vietnam. Interim Report, HumRRO Division 4, Fort Benning, Georgia, July 1967. (FOR INTERNAL USE ONLY).

Melching, William H. A Concept of the Role of Man in Automated Systems. Paper presented at meeting of Southwestern Psychological Association, New Orleans, Louisiana, April 1968. HumRRO Professional Paper 14-68 (MANICON), May 1968. AD 671 128.

Nichols, Thomas F. and Theodore R. Powers. Moonlight and Night Visibility. Research Memorandum, HumRRO Division 3, Presidio of Monterey, California, January 1964.

Olmstead, Joseph A. et al. Selection and Training for Small Independent Action Forces: Development of Materials and Procedure. HumRRO Technical Report 71-17, August 1971.

Olmstead, Joseph A. et al. Selection and Training for Small Independent Action Forces: Final Report. HumRRO Technical Report 72-2, February 1972.

Pare, Monte M. et al. The Psychological Effects of Non-Nuclear Weapons: A Bibliography with Selected Abstracts, Vol. I. Technical Report, University of Oklahoma Research Institute, Norman, Oklahoma, April 1964.

Quade, E. S. Cost-Effectiveness: Some Trends in Analysis. RAND Paper P-3529-1, RAND Corporation, Santa Monica, California, March 1970.

Quade, E. S. On the Limitations of Quantitative Analysis. RAND Paper P-4530, RAND Corporation, Santa Monica, California, December 1970.

Rigg, Robert B. Realistic Combat Training and How to Conduct It. Harrisburg, Pennsylvania: Military Service Publishing Company, 1955.

Rogers, Donald D. The Cost Analysis of Instructional Development: Some Managerial Considerations. Paper presented at Annual Meeting of the Texas Association of Educational Technology, El Paso, Texas, November 1972. ERIC FD 070 261. (Ref: Research in Education, April 1973, 8(4), p. 49).

Rupe, J. C. Procedures for Obtaining Human Factors Information as an Integral Part of Weapon System Design and Development. Paper presented at 7th Annual Army Human Factors Engineering Conference, University of Michigan, Ann Arbor, Michigan (UPSTREAM III), October 1961.

GENERAL Training (Cont'd)

Rupe, J. C. The Prediction of Training Requirements for Future Weapon Systems: A Personnel Support System Research and Development Process. HumRRO Technical Report 83 (UPSTREAM III), April 1963. AD 403 280.

The current state of the art--particularly that of the Army--for predicting personnel and training requirements during weapon system design and development was determined by means of a literature review. The main object of this study was to develop procedures for effectively and economically providing human factors data, and products based upon them, needed for concurrent building of a Personnel Support System (conceived to be the operator and maintenance personnel for a weapon system and the basic job data, equipment, and materials required for selecting and training these personnel).

Saul, Ezra V. and Jack Jaffe. Reliabilities and Correlational Independence of Measures of Marksmanship Performance. Project Report No. 5, Institute for Applied Experimental Psychology, Tufts University, Medford, Massachusetts, 1955.

Schaffer, M. C. Basic Measures for Comparing the Effectiveness of Conventional Weapons. RAND Memorandum 4647-PR, The RAND Corporation, Santa Monica, California, January 1966.

Showel, Morris. Forecasting Trainee Performance on BCT Proficiency Tests. Staff Paper, HumRRO Division 3, Presidio of Monterey, California, December 1966 (FOR INTERNAL USE ONLY)

Shriver, Edgar L. A Theoretical Approach to Forecasting the Training Demands Imposed by New Army Weapon Systems. HumRRO Division 1, Staff Memorandum (FORECAST), December 1956 (FOR INTERNAL USE ONLY).

Shriver, Edgar L. et al. Increasing Electronics Maintenance Proficiency Through Cue-Response Analysis. Research Memorandum, HumRRO Division 2, Fort Knox, Kentucky (FORECAST II), October 1959.

Shriver, Edgar L. et al. FORECAST Systems Analysis and Training Methods for Electronics Maintenance Training. HumRRO Research Report 13, May 1964. AD 441 248.

Vallance, Theodore R. Some Relationships between Training Research and Human Engineering in the Design of Weapon Systems. In Army Human Factors Engineering Conference, Sixth Annual, Fort Belvoir, Virginia, October 1960.

CENERAL Training (Cont'd)

Ward, Joseph S. A Case Study of the Development of an Individual Combat Training Program. In Individual and Small Unit Training for Combat Operations, HumRRO Professional Paper 21-67, May 1967.

Wolff, Peter C. and Joseph Van Loo. Target Detection: Study 3, The Relative Usefulness of Active Participation and Verbal Description Techniques in Target Detection Training. Research Memorandum, HumRRO Division 2, Fort Knox, Kentucky (FIREPOWER IV), July 1962. AD 487 891.

Wolff, Peter C. et al. Group Training with Active Participation: Some Methodological Limitations, Perceptual and Motor Skills, February 1963, 16(1), 179-184.

Yale, Wesley W. The Evaluation of Combat Effectiveness, Army, May 1962, 68-73.

GENERAL

Training Devices

Adair, Charles H. and John T. Foster. A Guide to Simulation Design. ISD, P.O. Box 3330, Leon Station, Tallahassee, Florida 32303, 1973. (\$4.50).

Adams, Jack A. Part Trainers. In Glen Finch (Ed.), Educational and Training Media, Washington, D.C., National Academy of Sciences, National Research Council, August 1959, pp. 129-149.

Ammons, R. B. et al. Transfer of Training in a Simple Motor Skill Along the Speed Dimension. Technical Report 53-498, Wright Air Development Center, Wright-Patterson AFB, Ohio, March 1954. Also in Perceptual and Motor Skills, 1956, vol. 6. AD 32 537. (Cited, with annotations, in Valverde et al, 1973).

Aukes, Lewis E. and George B. Simon. The Relative Effectiveness of an Air Force Training Device Used Intact Versus With Isolated Parts. Research Report AFPTRC-TN-57-77, Air Force Personnel & Training Research Center, Lackland Air Force Base, Texas, June 1957. AD 131 429.

Barrett, Gerald V., Minoru Kobayashi, and Bernard H. Fox. Driving at Requested Speed: Comparison of Projected and Virtual Image Displays. Human Factors, 1968, vol. 10, no. 3, pp. 259-262.

Behavioral Sciences Laboratory, Wright Air Development Division. Uses of Task Analysis in Deriving Training and Training Equipment Requirements. BSL, Wright Air Development Division, Wright-Patterson AFB, Ohio, Technical Report 60-593, December 1960, AD 252 946.

Berkun, Mitchell M., Hilton M. Bialek, Richard P. Kern, and Kan Yagi. Experimental Studies of Psychological Stress in Man. HumRRO Research Report 10, December 1962.

Besnard, Guy G. et al. The Improved Subject-Matter Trainer. Technical Memorandum ASPRL TM 55-11, Armament Systems Personnel Research Laboratory, Air Force Personnel and Training Research Center, Lowry Air Force Base, Colorado, April 1955.

Biel, W. C., H. H. Harman, and M. S. Sheldon. Exercising Teams in Military Systems Through the Use of Simulation. System Development Corporation, Santa Monica, California, October 1964.

Blaiwes, Arthur S., and James J. Regan. An Integrated Approach to the Study of Learning, Retention, and Transfer -- A Key Issue in Training Device Research and Development. Technical Report NAVTRADEVCEM IH-178, Naval Training Device Center, Orlando, Florida, August 1970.

GENERAL Training Devices (Cont'd)

Bogdanoff, E., H. E. Brooks, F. J. Jasinski, L. B. Keys, A. L. Michael, A. R. Molnar, G. L. Proctor, E. Y. Reeves, and B. A. Thorsell. Simulation: An Introduction to a New Technology. Technical Memorandum 499, System Development Corporation, Santa Monica, California, March 1960.

Bowen, Hugh M., Allen Hale, and Charles R. Kelley. Tracking Training V: Field Study of the Training Effectiveness of the General Vehicular Research Tool. Technical Report NAVTRADEVCEW 955-1, U.S. Naval Training Device Center, Port Washington, New York, December 1962.

Bushnell, Don D. System Simulation: A New Technology for Education. System Development Corporation, Santa Monica, California, April 1962.

Caro, Paul W., Jr. Reduction of Helicopter Pilot Attrition Through Synthetic Contact Flight Training. Paper presented at American Psychological Association Convention, Chicago, Illinois, September 1965, (ECHO II), HumRRO Division No. 6, Fort Rucker, Alabama.

The reduction of flight attrition in primary helicopter training through the use of a synthetic contact flight training device is described. The device, a one-man helicopter mounted on a ground effects machine through an articulated linkage which allows freedom of movement in six dimensions, preserves the handling characteristics and visual, auditory, and proprioceptive cues of the in-flight task. Two experimental groups received 3 1/4 or 7 1/2 hours device training, and their attrition rates during subsequent flight training were compared to that of controls. The synthetic training groups experienced lower attrition ($p < .01$) than the controls. No significant difference existed between experimental groups.

Caro, Paul W., Jr. and Robert N. Isley. Changes in Flight Trainee Performance Following Synthetic Helicopter Flight Training. Paper presented at Southeastern Psychological Association meeting, New Orleans, Louisiana, April 1966, HumRRO Professional Paper 1-66 (ECHO II). AD 630 484.

Research was conducted to determine whether student performance on helicopter contact flight training could be improved with the use of a helicopter training device. Four groups of subjects, two experimental and two control, were used. Results showed that the experimental subjects acquired the necessary skills with less inflight training during the pre-solo phase of training. The most significant improvement occurred in the reduction in elimination rates during subsequent flight training.

GENERAL Training Devices (Cont'd)

Caro, Paul W., Jr. and Robert N. Isley. Helicopter Trainee Performance Following Synthetic Flight Training. Published in Journal of the American Helicopter Society, July 1966, vol. 11, no. 3, HumRRO Professional Paper 7-66, November 1966. AD 646 157.

Two groups of trainees at the U.S. Army Primary Helicopter School were trained to "fly" a captive helicopter mounted on a ground effects machine. The device had the approximate handling characteristics of a free-flying vehicle, yet it allowed the trainees to obtain "aeronautical experience" not otherwise possible at their level of training. It was found that the device-trained subjects, when compared with non-device-trained controls, were significantly less likely to be eliminated from subsequent primary helicopter training for reasons of flight skills deficiency. Further, measures of relative performance during primary flight training indicated the device-trained group soloed the helicopter earlier and made better flight grades during the pre-solo phase of training than did the controls.

Caro, Paul W. et al. The Captive Helicopter as a Training Device: Experimental Evaluation of a Concept. HumRRO Technical Report 68-9, June 1968. AD 673 436.

Caro, Paul W. Equipment-Device Task Commonality Analysis and Transfer of Training. HumRRO Technical Report 70-7 (ECHO IV), June 1970. AD 709 534.

Caro, Paul W. and Wallace W. Prophet. Some Considerations for the Design of Aircraft Simulators for Training. Paper presented at Psychology in the Air Force Symposium (1st), U.S. Air Force Academy, Colorado Springs, Colorado, April 1971. HumRRO Division 6, Fort Rucker, Alabama (SYNTRAIN).

Caro, Paul W. et al. Research on Synthetic Training: Device Evaluation and Training Program Development. HumRRO Technical Report, in press.

Conforti, Gilbert. Dynamism through Devices, Infantry, January-February, 1973, 63(1), 13-14.

Cox, John A. Feasibility Study of Substituting Training Devices for Tactical Equipment in Advanced Individual Training for MOS 179. Draft Consulting Report, HumRRO Division No. 5, January 1965. (FOR INTERNAL USE ONLY).

Cox, John A. et al. Functional and Appearance Fidelity of Training Devices for Fixed-Procedures Tasks. HumRRO Technical Report 65-4, June 1965. AD 617 767.

GENERAL Training Devices (Cont'd)

Crawford, Meredith P. Simulation in Training and Education. HUMERO Professional Paper 40-67, September 1967, presentation at NATO Symposium on "The Simulation of Human Behavior," Paris, France, July 1967.

Davis, Robert H., and Richard A. Behan. Evaluating System Performance in Simulated Environments. In Psychological Principles in System Development, Robert M. Gagne (Ed.), Holt, Rinehart and Winston, Inc., New York City, 1962, pp. 477-515.

Demaree, R. G. Development of Training Equipment Planning Information. Technical Report 61-533, Advanced Systems Division, Wright-Patterson AFB, Ohio, October 1961. AD 267 326.

Department of the Army. Index and Description of Army Training Devices. DA Pamphlet 310-12, 2 October 1972.

Dougherty, Dora J., Robert C. Houston, and Douglass R. Nicklas. Transfer of Training in Flight Procedures From Selected Ground Training Devices to the Aircraft. Technical Report NAVTRADEVCEEN 71-16-16, Naval Training Device Center, Port Washington, New York, September 1957.

Duncan, C. P. and B. J. Underwood. Transfer of Training in Motor Learning as a Function of Degree of First-Task Learning and Inter-Task Similarity. Technical Report 52-64, Wright Air Development Center, Wright-Patterson AFB, Ohio, April 1952. DDC ATI 172 519. (Cited, with annotations, in Valverde et al, 1973).

Eckstrand, G. A. Response Practice as a Factor in Transfer of Training. Air Force Technical Report 6017, U.S. Air Force, Washington, D.C., July 1950. DDC ATI 82 501.

Eckstrand, Gordon A. A Human Factors Approach to the Design of Training Equipment, Air Training Command Instructors Journal, 1954, 2, 148-151.

Eckstrand, G. A. and M. R. Rockway. The Role of Simulators for Spacecrew Training, Astronautics, 1960, 5, pp 38-39, 76, 79, 80. (Cited, with annotations, in Valverde et al, 1973).

Eckstrand, Gordon A. Human Resources Considerations in the Development of Complex Systems. Presidential Address presented to Division of Military Psychology, American Psychological Association Convention, Honolulu, Hawaii, 4 September 1972. Technical Report 72-64, Air Force Human Resources Laboratories, Brooks AFB, Texas, 1972.

GENERAL Training Devices (Cont'd)

Fitzpatrick, Robert. Toward a Theory of Simulation. System Development Corporation, Santa Monica, California, November 1962.

Gagne, Robert M. Training Devices and Simulators: Some Research Issues, American Psychologist, 1954, vol. 9, no. 3, pp. 95-107.

Geisler, Murray A., Allen S. Ginsberg. Man-Machine Simulation Experience. Rand Paper P-3214, The Rand Corporation, Santa Monica, California, August 1965. AD 469 621.

Grimsley, Douglas L. Acquisition, Retention and Retraining: Effects of High and Low Fidelity in Training Devices. HumRRO Technical Report 69-1, February 1969 (STRANGER III). AD 685 074.

Grimsley, Douglas L. Acquisition, Retention and Retraining: Group Studies on Using Low Fidelity Training Devices. HumRRO Technical Report 69-4, March 1969 (STRANGER III). AD 686 741.

Grimsley, Douglas L. Acquisition, Retention, and Retraining: Training Category IV Personnel with Low Fidelity Devices. HumRRO Technical Report 69-12, June 1969 (STRANGER III).

Grodsky, Milton A. The Use of Full Scale Mission Simulation for the Assessment of Complex Operator Performance, Human Factors, 1967, vol. 9, pp. 341-348.

Harmon, Harry H. Simulation: A Survey. System Development Corporation, Santa Monica, California, July 1961.

Howell, William C. and Charles F. Gettys. Some Principles for Design of Decision Systems: A Review of the Final Phase of Research on a Command-Control System Simulation. Technical Report AMRL-TR-68-158, Aerospace Medical Research Laboratories, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, November 1968.

Institute for Applied Experimental Psychology, Tufts University. Evaluation of Gunnery Training Devices - Devices 3-E-7 & 3-A-40. Technical Report SDC 58-1-6, Special Devices Center, Port Washington, New York, 1 April 1950.

Isley, Robert N. Inflight Performance After Zero, Ten, or Twenty Hours of Synthetic Instrument Flight Training, HumRRO Professional Paper 23-68, June 1968.

Jeantheau, G. G. The Use of Multi-Man System Trainers, Ergonomics, 1969, vol. 12, no. 4, pp. 533-542.

Jolley, Oran B. and Paul W. Caro, Jr. A Determination of Selected Costs of Flight and Synthetic Flight Training. HumRRO technical Report 70-6 (ECHO III), April 1970. AD 706 764.

Kelley, Charles R., and Michael J. Wargo. Adaptive Techniques for Synthetic Flight Training Systems. Technical Report NAVTRADEVCECEN 68-C-0136-1, Naval Training Device Center, Orlando, Florida, October 1968.

GENERAL Training Devices (Cont'd)

Maruff, E. B. and C. E. Buxton. An Experimental Study of the Effectiveness of Various Training Procedures Used with the Aerial Gunnery Training Device, 3-A-35 and 3-A-2 and 57-1-1. Report No. 2 For Special Devices Center, Fort Washington, New York (prepared by State University of Iowa), 1 July 1945.

Lee, Gilbert B. The Construction of a Model Terrain Simulator at a Scale of 1:100. Report of Project MICHIGAN, Report No. 2144-362-T, University of Michigan, Willow Run Laboratories, Ann Arbor, March 1959.

Devine, M. Transfer of Tracking Performance as a Function of a Delay Between the Control and the Display. Technical Report 53-287, Wright Air Development Center, Wright-Patterson AFB, Ohio, November 1953. AD 29-359. (Cited, with annotations, in Valverde et al, 1973).

Dumasaine, Arthur A. Design of Training Aids and Devices. In Human Factors Methods for System Design, John D. Polley, Jr., Ed., 1960. AD 232 846.

Dumasaine, A. A. Graphic Aids, Models, and Mockups as Tools for Individual and Classroom Instruction. In Glen Finch (Ed.) Educational and Training Media. National Academy of Sciences -- National Research Council, Washington, D. C., August 1953, pp. 99-113.

McLelland, W. A. Simulation and Training Device Requirements Research. Human Resources Research Office, Alexandria, Virginia, paper read at meeting of an ad hoc group of OCRD, ACSFOR AND AMO ASTRAC members at Army Research Office, 5 March 1964. (FOR INTERNAL USE ONLY).

McLelland, William A. The Use of Part-Task Training and Operational Equipment as Training Devices. HUMRRO Division 1, paper for American Psychological Association convention, Cincinnati, Ohio, September 1959.

McCluskey, Michael A. Perspectives on Simulation and Miniaturization. Paper presented at CCNARC Training Workshop, Fort Gordon, Georgia, 5-7 October 1971. HUMRRO Professional Paper 14-72, June 1972. Published in Simulation and Games, March 1973, 4(1), 19-36.

Meyer, Donald F., Ralph E. Flexman, E. A. Gundy, David C. Van Millian, and Landman, C. I. A Study of Simulator Capabilities in an Operational Training Program. Technical Report AMRL-TR-67-14, Aerospace Medical Research Laboratories, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, May 1967.

Miller, Elmo E. Effective Low-Cost Simulation. Draft, HUMRRO Professional Paper, (HUMRRO Division No. 5), June 1973. (FOR INTERNAL USE ONLY).

Miller, R. B. A Method for Determining Human Engineering Design Requirements for Training Equipment. Technical Report 53-135, Wright Air Development Center, Wright-Patterson AFB, Ohio, June 1953. AD 15 848.

Miller, R. B. Task and Part-Task Trainers and Training. Technical Report 60-469, Wright Air Development Division, Wright-Patterson AFB, Ohio, June 1960. AD 245 652.

GENERAL Training Devices (Cont'd)

Montgomery, V. E. et al. Transfer of Training in Motor Learning as a Function of Distribution of Practice. Technical Report 52-115, Wright Air Development Center, Wright-Patterson AFB, Ohio, October 1952. AD 3242. (Cited, with annotations, in Valverde et al, 1973).

Muckler, F. A., J. E. Nygaard, L. I. O'Kelly, and A. C. Williams Jr. Psychological Variables in the Design of Flight Simulators for Training. WADC Technical Report 56-369, Aero Medical Laboratory, Air Research and Development Command, Wright-Patterson Air Force Base, Ohio, January 1959. AD 97 130.

Naval Training Equipment Center, Orlando, Florida. Training Device Guide. Naval Training Equipment Center, Orlando, Florida, NAVTRADEV P-530-2, revised 1 July 1971 with change pages 1, 15 January 1972, and 2, 10 August 1972.

Newton, John M. Training Effectiveness as a Function of Simulator Complexity. Technical Report NAVTRADEV CEN 458-1, U.S. Naval Training Device Center, Port Washington, New York, September 1959.

Osborn, William C. An Approach to the Development of Synthetic Performance Tests for Use in Training Evaluation. Paper presented to 12th Annual Military Testing Association Conference, French Lick, Indiana, September 1970. HumRRO Professional Paper 30-70, December 1970. AD 719 265.

Parker, J. F., Jr. and Judith E. Downs. Selection of Training Media. Technical Report 61-473, Advanced Systems Division, Wright-Patterson AFB, Ohio, September 1961. AD 271 483.

Parsons, Henry M. Man-Machine System Experiments, Baltimore, Maryland: Johns Hopkins University Press, 1972.

Prather, Dirk C. Prompted Mental Practice as a Flight Simulator, Journal of Applied Psychology, June 1973, 57(3), 353-355.

Prophet, Wallace W. Synthetic Flight Training Devices. HumRRO Division 6, paper for CONARC briefing, Fort Monroe, Virginia, February 1970. In HumRRO Research in Training Technology, Professional Paper 21-70, June 1970. AD 712 285.

Prophet, Wallace W., and H. Alton Boyd. Device-Task Fidelity and Transfer of Training: Aircraft Cockpit Procedures Training. HumRRO Technical Report 70-10, July 1970.

GENERAL Training Devices (Cont'd)

Magrave, Michael J. Some Approaches to Simulation, Modeling, and Training in SDC. System Development Corporation, Santa Monica, California, March 1962.

McKinn, James H. I., Fleper, William J., and Folley, John C., Jr. Operator-Centered Instruction (LCI): Volume IV - The Simulated Maintenance Task Environment (SMTE): A GCS Specific Simulator. Technical Report AFHRL-TR-68-14, Air Force Human Resources Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Dayton, Ohio, 1968.

Moore, M. R. The Effect of Variations in Control-Display Ratio on Pilot Training on Transfer to a "High" Ratio. Technical Report 110-640, Wright Air Development Center, Wright-Patterson AFB, Ohio, October 1956. AD 98 317.

Moore, M. R. et al. The Effect of Variations in Control-Display Ratio on Pilot Training on Transfer to a Low Ratio. Technical Report 110-640, Wright Air Development Center, Wright-Patterson AFB, Ohio, October 1956. AD 110 640.

Roberts, Miles S. The Appropriate Contribution of Simulation Techniques to System Training. System Development Corporation, Santa Monica, California, 1959.

Root, Robert T. An Annotated Bibliography of Research on Training Aids and Training Devices. Staff Memorandum, HARMO Division 1, Alexandria, Virginia, August 1957. AD 637 219.

Shannon, John. Military Potential Test of Certain Training Devices. Report No. 1, Development and Production Wing, Aberdeen Proving Ground, Maryland, January 1965. AD 637 219.

Shannon, John. Military Potential Test of Certain Training Devices. Report No. 2, Development and Production Wing, Aberdeen Proving Ground, Maryland, March 1965. AD 637 219.

Stegall, Arthur E. and Wolf, J. Jay. Man-Machine Simulation Models: Psychological and Performance Interaction. New York: John Wiley and Sons, 1969.

Wade, Alfred F., Gruber, Alin, and Ely, Jerome H. Human Factors Considerations in the Design of Simulators for Operator Training. Technical Report NAVTRADDEVGEN 1103-1, U.S. Naval Training Device Center, Fort W. Ligon, New York, December 1961.

GENERAL Training Devices (Cont'd)

Isaacs, Alfred E., Gamber, Alvin, and Fly, Jerome H. The Measurement of Advanced Flight Vehicle Crew Proficiency in Synthetic Ground Environments. Technical Documentary Report AFRL TDR 62-2, 6576th Aerospace Medical Research Laboratories, Air Force Systems Command, Wright Patterson Air Force Base, Ohio, February 1962.

Thomson, Kenneth F. et al. A Survey of European Training Devices. NTIC 11-17, US Naval Training Device Center, Fort Washington, New York, May 1965. AD 630 296.

Valverde, Horace H. Maintenance Training Media: An Annotated Bibliography. Technical Report 67-151, Aerospace Medical Research Laboratories, US Air Force, 1968. ("Describes, classifies, and graphically presents representative training media. The bibliography contains references to government sponsored research and development reports from 1950-1968 concerning: (1) training media requirements, (2) training aids, including graphics, motion pictures, TV, and general training aids, (3) trainers, and (4) teaching machines." Psychological Abstracts, December 1968, 62 (12), p 1923.)

Valverde, Horace H. et al. Annotated Bibliography of the Advanced Systems Division Reports (1950-1972). Technical Report AFHRL TR 72-93, Air Force Human Resources Laboratory Advanced Systems Division, Wright Patterson Air Force Base, Ohio, March 1973.

Wattrock, M. C. Three Conceptual Approaches to Research on Transfer of Training. Chapter 9 of Learning Research and School Subjects, Robert M. Gagne and William G. Gephart, Eds. Itasca, Ill.: F. L. Peacock Publishers, Inc., 1968, pp 150-189.

Woss, M. L. Continuously Adaptive versus Discrete Changes of Task Difficulty in the Training of a Complex Perceptual Motor Task. In Proceedings, 77th Annual Convention, American Psychological Association, Washington. APA, 1969, pp 757-758.

FIELD ARTILLERY

Training

*Department of the Army. AR 385-62. Firing Guide: Missiles and Rocket Launchers for Training, Target Practice, and Combat. Army Regulation, 17 April 1967, with Change 1.

Department of the Army. TFO 3646, Weapons of the Field Artillery, training film, color, 39 minutes, 1966. Features use and capabilities of field artillery weaponry in the cannon type artillery category and rocket and missile category.

Department of the Army. TFO-4050, Field Artillery, Ammunition and Fuses, training film, color, 27 minutes, 1969. Characterization, functioning and effects of the semi-fixed and separate loading ammunition used by the 5 field artillery weapons. 105 155 8 inch 175.

Department of the Army. MF66-7900, Fire-Artillery Action in Korea, film, Black & White, 14 minutes, 1952. Depicts the important role of artillery fire in modern warfare.

Department of the Army. FM 6-2. Field Artillery Survey. Field Manual, 19 June 1970.

Department of the Army. FM 6-10. Field Artillery Communications. Field Manual, 6 March 1970.

Department of the Army. FM 6-20. Field Artillery Tactics and Organization. Field Manual, 30 August 1973 (Supersedes FM 6-20-1 & 6-20-2).

Department of the Army. FM 6-36. Field Artillery Battery, LANCE. Field Manual, 30 April 1973.

Department of the Army. FM 6-38. Field Artillery Battery, M109A1. Field Manual, 29 January 1970.

Department of the Army. FM 6-40. Field Artillery Cannon Battery. Field Manual, 5 October 1967, with Changes 1 and 2.

*** is entered under another heading.

FIELD ARTILLERY Training (Cont'd)

Department of the Army. FM 6-40-1. Field Artillery, HONEST JOHN Rocket Gunnery. Field Manual, 8 June 1972.

Department of the Army. FM 6-54. 115-mm Area Toxic Rocket System. Field Manual, 31 January 1964.

Department of the Army. FM 6-59. Field Artillery Rocket, HONEST JOHN, with Launchers M386 and M33. Field Manual, 24 September 1963, with Change 1.

Department of the Army. FM 6-60. Field Artillery Rocket, HONEST JOHN, with Launcher M289. Field Manual, 29 December 1964, with Changes 1 and 2.

Department of the Army. FM 6-70. 105mm Howitzer, Light, M102, Towed. Field Manual, 27 March 1970.

Department of the Army. FM 6-75. 105mm Howitzer, M101-series, Towed. Field Manual, 26 February 1963.

Department of the Army. FM 6-77. 105-mm Howitzer M52, Self-Propelled. Field Manual, 11 December 1956, with Change 1.

Department of the Army. FM 6-78. 75-mm Pack Howitzer M1A1. Field Manual, 10 August 1962.

Department of the Army. FM 6-79. 105-mm Howitzer, M108, Self-Propelled. Field Manual, 9 January 1963, with Changes 1 and 2.

Department of the Army. FM 6-81. 155-mm Howitzer, M114, Towed. Field Manual, 28 March 1962, with Changes 3 and 4.

Department of the Army. FM 6-88. 155-mm Howitzer, M109, Self-Propelled. Field Manual, 20 December 1962, with Change 3.

Department of the Army. FM 6-90. 8-inch Howitzer M115 Towed. Field Manual, 21 November 1962, with Change 1.

Department of the Army. FM 6-92. 155-mm Howitzer M44, Self-Propelled. Field Manual, 4 April 1962, with Change 2.

Department of the Army. FM 6-94. 175-mm Gun M107 Self-Propelled, and 8-inch Howitzer M110 Self-Propelled. Field Manual, 20 May 1968, with Change 1.

Department of the Army. FM 6-121. Field Artillery Target Acquisition. Field Manual, 1 November 1967.

FIELD ARTILLERY Training (Cont'd)

Department of the Army. FM 6-125. Qualification Tests for Specialists, Field Artillery. Field Manual, 9 February 1972.

Department of the Army. FM 6-135. Adjustment of Artillery Fire by the Combat Soldier. Field Manual, 14 February 1969.

Department of the Army. FM 9-59. Missile Support Unit Operations. Field Manual, 26 March 1970.

Department of the Army. ASubjSed 6-1. Field Artillery Ammunition. Army Subject Schedule, 10 January 1972.

Department of the Army. ASubjSed 6-4. Field Artillery Combat Intelligence. Army Subject Schedule, 16 November 1970.

Department of the Army. ASubjSed 6-5. Communications Training for Sections and Platoons. Army Subject Schedule, 16 October 1968.

* Department of the Army. ASubjSed 6-6. Communication Exercises for Field Artillery Units. Army Subject Schedule, 4 February 1972.

Department of the Army. ASubjSed 6-8. Counterbattery Operations. Army Subject Schedule, 27 March 1970.

Department of the Army. ASubjSed 6-10. Field Artillery Radar Operations. Army Subject Schedule, 7 August 1968.

Department of the Army. ASubjSed 6-11. Defense of Field Artillery Position Areas. Army Subject Schedule, 15 January 1970.

* Department of the Army. ASubjSed 6-12. Field Exercises, Field Artillery. Army Subject Schedule, 20 May 1971.

Department of the Army. ASubjSed 6-13A10. MOS Technical Training of Commander. Army Subject Schedule, 15 March 1973.

Department of the Army. ASubjSed 6-13D20. MOS Technical Training and Refresher Training of Field Artillery Rocket Crewman MOS 13D20. Army Subject Schedule, 30 January 1969 with Change 1.

Department of the Army. ASubjSed 6-13E20. MOS Technical Training of Field Artillery Cannon Operations/Fire Direction Assistant, MOS 13E20. Army Subject Schedule, 15 March 1973.

FIELD ARTILLERY Training (Cont'd)

Department of the Army. ASubjSed 6-14. Fire Support Coordination.
Army Subject Schedule, 20 July 1970.

Department of the Army. ASubjSed 6-15B10. MOS Technical Training
and Refresher Training of SERGEANT Missile Crewman MOS 15B10. Army
Subject Schedule, 25 September 1969.

Department of the Army. ASubjSed 6-15E10. MOS Technical Training and
Refresher Training of PERISHING (PIA) Missile Crewman (MOS 15E10).
Army Subject Schedule, 31 December 1968 with Change 1.

Department of the Army. ASubjSed 6-17. Field Artillery Liaison. Army
Subject Schedule, 20 November 1970.

Department of the Army. ASubjSed 6-17A10. MOS Technical Training of
Combat Surveillance and Target Acquisition Crewman MOS 17A10. Army
Subject Schedule, 6 August 1971.

Department of the Army. ASubjSed 6-22. Conduct of Observed Fires.
Army Subject Schedule, 28 April 1968.

Department of the Army. ASubjSed 6-25. Field Artillery Sound Ranging.
Army Subject Schedule, 20 May 1969.

Department of the Army. ASubjSed 6-29. Artillery Survey. Army Sub-
ject Schedule, 5 February 1969.

Department of the Army. ASubjSed 6-30. Umpiring and Aggressor Forces.
Army Subject Schedule, 1 September 1964.

* Department of the Army. ASubjSed 6-32. Field Artillery Command Post
Exercises (CPX). Army Subject Schedule, 17 June 1970.

Department of the Army. ATP 6-100. Field Artillery Cannon Units.
Army Training Program, 9 July 1968.

Department of the Army. ATP 6-175. Field Artillery Rocket Units,
HONEST JOHN Rocket. Army Training Program, 11 September 1969.

Department of the Army. ATP 6-558. Field Artillery Searchlight Bat-
tary. Army Training Program, 8 September 1969 with Change 1.

Department of the Army. ATP 6-575. Field Artillery Target Acquisition
Battalion. Army Training Program, 5 September 1969.

FIELD ARTILLERY Training (Cont'd)

Department of the Army. ATT 6-175. Field Artillery Battalion (Battery).
Army Training Test, 21 August 1972.

HumRRO Division No. 1. Survey of the Educational Program of the Artillery School, Antiaircraft and Guided Missiles Branch, Fort Bliss, Texas.
Special Report 1, December 1952. AD 2 314.

HumRRO Division No. 1. USARADCOM Integrated Fire Control Training Guide. Research By-Product, HumRRO Division No. 1, Alexandria, Virginia (LOCK-ON), July 1957. AD 158 584.

Kotras, Edward C. and John W. Harris. Comparison Test of Howitzer, Heavy, Self-Propelled, Full-Track, 8-inch, M110. Final Report, 8 November 1966 -- 11 May 1967, Aberdeen Proving Ground, Maryland, July 1967. AD 903 172L.

Marriott, John C. Armament (105-mm Howitzer) and the Man, Ordnance,
September-October 1969, 54, 186-189.

Nelson, Gary W. The Junior Infantry Leader and Field Artillery,
Infantry, January-February 1973, 25-27.

Plaskett, W., Jr. New Life for Towed 155 How, Marine Corps Gazette,
February 1969, p. 51.

Ringham, Lee O. LANCE, The Field Artilleryman, August 1971, pp. 4-11.

Stearn, V. K. and Joseph G. Hayek. Comparison Test of Howitzer, Medium, Self-Propelled, Full-Track, 144-MM, M109. Final Report, 26 February-13 May 1969, Aberdeen Proving Ground, Maryland, June 1969. AD 902 799L.

U.S. Army Artillery School. Methods of Evaluating the Comparative Effectiveness of the 4.2" Mortar and the 105mm Howitzer. U.S. Army Artillery School, Fort Sill, Oklahoma, January 1954.

U.S. Army Field Artillery School. Catalog of Instructional Material: Unit, Section and Staff Training. For period 1 July 1972 - 30 June 73.

Van Wyck, A. P. et al. Human Engineering Survey of Honest John Weapons System. (U) Technical Memorandum 24, Human Engineering Laboratory, Aberdeen Proving Ground, Maryland, 1956.

FIELD ARTILLERY Training (Cont'd)

Woolman, Myron. The Development and Evaluation of On-Site Training for NIKE Integrated Fire Control Operators. Paper prepared for American Psychological Association, HumRRO Division No. 1, Alexandria, Virginia, September 1958 (LOCK-ON 1).

A method of training inexperienced Nike integrated fire control (IFC) operators on-site was developed and experimentally tested. The experiment involved 24 Nike batteries, six in each of four training methods (N=424 operators). The four experimental methods were: The Experimental Program, Periodic Evaluation, Experimental Program plus Periodic Evaluation, and Controls (conventional training). Periodic Evaluation consisted of frequent evaluations of operator performance. Operators given the Experimental Program were significantly superior to Controls in both performance (split-half reliability .91) and written test results (split-half reliability .95). Periodic Evaluation offered no significant training benefits.

Woolman, Myron. On-Site Training of Guided Missile Operators. HumRRO Technical Report 64 (LOCK-ON I), August 1960. AD 244 250.

The study was concerned with developing and testing a method of training Nike IFC operators on site. In a five-month field test, three experimental methods were compared with conventional training. The principal experimental method -- Operational Context Training -- was incorporated in a Training Guide that included (a) a step-by-step breakdown of all operator procedures, (b) specific instructional techniques for use by battery personnel without experience as instructors, and (c) a systematic method of evaluating trainees. Operators trained by the various methods were compared by means of job-sample and written criterion tests, and by other measures. Operators trained by the OCT method were more proficient than those trained by the other methods in the study; OCT-trained operators were as proficient as school-trained personnel with greater on-site experience.

Woolman, Myron. On-Site Training of Guided Missile Operators: Evaluation Materials. Research Memorandum, HumRRO Division No. 1, Alexandria, Virginia, October 1960. AD 489 291.

FIELD ARTILLERY

Training Devices

Copeland, D. Robert. Utilization of Field Artillery Missile and Rocket Trainers Developed by U.S. Army Participation at the U.S. Naval Training Device Center, Training Device Developments, December 1963, pp 1-3. (Port Washington, N. Y.: U.S. Naval Training Device Center, NAVEXOC P-1300-30, December 1963).

Department of the Army. MF 6-5246. Field Artillery Observation. Film, black and white, 19 minutes, 1967. New terms, phrases and format effected by U.S. Army, 1 September 1966, in FO communications and procedures for improved direction of FA Fire.

Department of the Army. FS 6-84. Observed Fire Procedure Trainer -- Part I. Filmstrip, color, 147 frames, 1959. Forward observation procedure in adjusting artillery fire -- Preparation of data for initial rounds, sensings and subsequent fire requests, precision, fuze and time registration.

Department of the Army. FS 6-85. Observed Fire Procedure Trainer -- Part II. Filmstrip, color, 106 frames, 1959. Forward observation procedure in adjusting artillery fire -- fuze quick mission, fuze delay mission, fuze time mission, and fuze variable time mission.

Department of the Army. FS 6-86. Observed Fire Procedure trainer -- Part III. Filmstrip, color, 95 frames, 1959. Forward observation procedure in adjusting artillery fire - fuze time mission, destruction mission, fuze variable time mission, and fuze quick mission.

*Department of the Army. ASubjSch 6-6. Communication Exercises for Field Artillery Units. Army Subject Schedule, 4 February 1972.

*Department of the Army. ASubjSch 6-12. Field Exercises. Field Artillery. Army Subject Schedule, 20 May 1971.

*Department of the Army. ASubjSch 6-32. Field Artillery Command Post Exercises (CPX). Army Subject Schedule, 17 June 1970.

Aggen, Donald E. Training Methods for Simulators of Remote Control Air Guided Missile Systems: 1. A Comparative Evaluation of Command Skill and Total Skill Training Exercises. Research Memorandum, Human Research Unit, Fort Knox, Kentucky, July 1962.

FIELD ARTILLERY Training Devices (Cont'd)

Horrocks, John E. et al. Study of the Present Status of Training Aids and Devices in the Army Field Artillery Training Program. Technical Report, Ohio State University Research Foundation, Columbus, Ohio, June 1956. AD 642 596.

*Spellman, E. A. Development of a Rocket-Blast Simulator: Design and Test. Technical Memorandum 4-64, Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, February 1964.

U.S. Army Field Artillery Board. Sergeant Missile System Trainer (Notes from the U.S. Army Field Artillery Board), Field Artilleryman, September 1970, p 7.

Valverde, Horace H. et al. Evaluation of a Device to Train Forward Air Controllers to Communicate Target Locations. Technical Report 72-12, Air Force Human Resources Laboratories, Brooks AFB, Texas, May 1972. AD 751 292.

Zierak, R. A. and John W. Martin. Mini-Training, The Field Artilleryman, April 1970, pp 61-64.

ARMOR

Training

*Armed Forces Journal. TOW Gets Shillelaghed? (with inset: Shillelagh Conversion Kit on House Floor), Armed Forces Journal, 18 April 1970, 107(31), page 8.

*Army. Army Missiles in Service and Under Development, Army, June 1973, 23(6), 16-22.

Baker, Robert A. et al. The Effects of Increasing and Decreasing Training Time on Proficiency in the Critical Armor Skills. HumRRO Technical Report 55, June 1959 (SHOCKACTION V). AD 218 272.

Bancroft, Charles A. An Analysis of the M-48 Troop Test Firing Data. HumRRO Staff Memorandum, March 1955.

Bancroft, Charles A. Error in the Use of M1 Gunner's Quadrant. HumRRO Staff Memorandum, June 1955 (FIREPOWER III). AD 480 315.

Byrne, J.D. Erector Set Artillery, Army, May 1957, 60+ (105mm Howitzer).

Cook, John G. and Robert A. Baker. The Armored Cavalry Platoon Combat Readiness Check. In Armored Cavalry Platoon Training and Evaluation. HumRRO Professional Paper 28-68, September 1968. AD 676 778. Also printed in Armor, January-February 1967, 76(1).

DeBurger, Robert A. The Effects of Practice on the Performance of Basic Armor Skills at Night. Research Memorandum, HumRRO Division 2, Fort Knox, Kentucky (ARMGRNITE VIII), January 1961. AD 477 648.

Department of the Army. AR 385-62. Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat. Army Regulation, 17 April 1967, with Change 1.

Department of the Army. TF 17-2504. Armor Combat Power. Training film, black and white, 24 minutes, 1958. Features fire capability of vehicle and weapon organic to armor mission, organization, fire potential, tank platoon and armor Infantry platoon.

Department of the Army. TF 17-3740. Armor Mobile Forces Fire Power Demonstration. Training film, color, 22 minutes, 1967. Demonstration of fire power capabilities of armored task forces presented by the Armor School at Fort Knox, Kentucky.

ARMOR Training (Cont'd)

Department of the Army. TF 17-3905. Orientation on Armor. Training film, color, 18 minutes, 1968. Role in weaponry of modern armor, employment of armor units in Europe, Alaska, SE Asia. Potential use of armor in a nuclear environment.

Department of the Army. FM 17-12. Tank Gunnery. Field Manual, 10 November 1972.

Department of the Army. FM 17-15. Tank Units, Platoon, Company, and Battalion. Field Manual, 25 March 1966, with changes 1 and 2.

Department of the Army. TC 17-11. The Tank Loader's Guide (Tank 105-mm Gun, M60). Training Circular, 26 October 1962.

Department of the Army. TC 17-12. M551/SHILLELAGH Gunnery. Training Circular, 29 January 1969, with Change 1.

Department of the Army. ASubjSch 17-12. Tank and M551 Gunnery Training. Army Subject Schedule, 9 July 1971.

Department of the Army. ASubjSch 17-37. Tank Company and Light Armor Company. Army Subject Schedule, 22 September 1971.

Department of the Army. ATP 17-37. Tank Company. Army Training Program, 17 March 1971.

Department of the Army. ATT 17-37. Tank Company and Light Armor Company. Army Training Test, 7 September 1971.

Department of the Army. ATT 17-37-1. Tank Platoon. Army Training Test, 14 December 1971.

Department of the Army. TM 9-1425-465. Operator's Manual: SHILLELAGH System Description (U). Technical Manual, 24 November 1969. (CONFIDENTIAL).

Easley, David L. An Evaluation of a New Retical Design System for Gunlaying against Flashes. HumRRO Research Memorandum, November 1964 (ARMORNITE X). AD 455 070.

Haggard, Donald F. and Albert R. Wright. Human Factors Evaluation of the Tank, Combat, Full Tracked: 105mm Gun, M60. HumRRO Consulting Report, February 1961 (FIREPOWER VIII). AD 487 893.

*Hunt, William T. Carry a Big Stick, Army Digest, November 1970, 25 (11), 60-61 (Shillelagh training).

Jones, Warren W. Development Test of Water Projectile for 105mm Howitzer. Aberdeen Proving Ground, Maryland, January 1956. AD 107 253L.

ARMOR Training (Cont'd)

Kelsay, Donald C. The Training Effectiveness of Table VII of the Tank Gunnery Qualification Course. Research Memorandum, U.S. Army Armor Human Research Unit, Fort Knox, Kentucky, April 1959. AD 487 892L.

Kidwell, Birtun S., Jr. Lightweight Tank Would Suit Corps, Marine Corps Gazette, February 1967, 8+. (Includes information on the Shillelagh).

Kraemer, Alfred J. The Effectiveness of 90mm Gun Fire Against the 18-inch Searchlight. HumRRO Technical Report 56, June 1959 (ARMORNITE III).

Kraemer, Alfred J. An Evaluation of Flash Localization Performance with the Fire Control System of the M48 Tank. HumRRO Technical Report 78, June 1962 (ARMORNITE X). AD 277 388.

Miller, Martin J., Jr. and Konrad F. Schreier, Jr. Revolution in Tank Armament, Army, March 1971, 21 (3), 49-53 (105-mm gun and Shillelagh).

Ogorzewicz, Richard M. Advances in Missile Armed Vehicles, Armor, May-June 1970, 79, 11-15.

Porter, Vonne F. et al. The Effect of Increased Subcaliber Substitution Training on 90mm Gunnery Proficiency. HumRRO Division No. 2, Fort Knox, Kentucky, Staff Memorandum (GUNNERY I), June 1955. AD 480 427.

Sheridan-Shillelagh Developments, Armor, January-February 1968, p. 58.

Schultz, Melvin A. Consistency in Laying the Main Tank Gun in a Live-Fire Situation. HumRRO Technical Report 39, June 1957 (FIREPOWER II). AD 137 195.

Schwartz, Shepard and Arthur Floyd, Jr. Improving Tactical Training for Tank Commanders: Test Development and Performance Assessment. HumRRO Technical Report 82, March 1963. AD 402 602.

Thune, Deland E. and Andrew J. Eckles III. Consistency in Re-laying as a Factor in Tank Gunnery. HumRRO Technical Report 25 (GUNNERY II), December 1955. AD 103 634.

This study was designed to measure the degree to which accuracy of fire in tank gunnery is limited by the operator's ability to re-lay the weapon on the same aiming point. Tests made on the M48 tank show that (a) highly consistent re-laying is possible with the range finder, the telescope, and the periscope; (b) variability in ranging and in action of the computer is a larger source of inconsistency than in aligning the sight reticle on the target; (c) consistency in re-laying is directly related to refinement and optical power of the fire control device used; and (d) consistency in re-laying by tank crews reaffirms the need for having bore-sight retention checks made by

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Thune, Leland E. and Andrew J. Eckles III (Cont'd)

skilled technicians using special aids. Tests made on the M47 Tank showed that both tank gunnery experts and trainees re-lay with high consistency, but that re-laying consistency of trainees as measured in this study is only very slightly related to gunnery proficiency.

U.S. Army Infantry Board. Evaluation of Cartridge, Training, 105mm, T55, with Fuze, Dummy, T185. Report, USAIB, Fort Benning, Georgia, December 1955. AD 82 373.

*Volz, Joseph. One Missile Program Too Many? Armed Forces Journal, 21 March 1970, 107 (27), p. 14 (compares TOW and Shillelagh).

Warnick, William L. and Robert A. Baker. Determination of Combat Job Requirements for Armored Cavalry Platoon Personnel. HumRRO Technical Report 92 (RECON I), December 1964. AD 455 302.

Weller, Jac. Tank Gunnery Training, National Guardsman, May 1972, 26, 2-8.

*Zierdt, John G. Stop that Tank! Ordnance, May-June 1965, p 621+. (Includes Shillelagh).

ARMOR

Training Devices

Baker, Robert A. and John G. Cook. ACT I, The Armored Cavalry Trainer: Can Reality Be Duplicated? Armor, March-April 1967, 76 (2). Also in Armored Cavalry Platoon Training and Evaluation, HumPRO Professional Paper 28-68, September 1968. AD 676 778.

Crain, Joel. Practice Shells for 105mm Howitzer, Field Artillery Journal, February 1963, 129+.

Denenberg, V. H. The Training Effectiveness of a Tank Hull Trainer. HumPRO Technical Report 3, February 1964. AD 26 012

Dixon, T. Donald et al. An Evaluation of a Gun Camera as an Aid in Tank-Gunnery Training. Staff Paper PAC-SP-190, Research Analysis Corporation, Bethesda, Maryland, March 1963.

Eckels, Andrew J. III and Curry E. Vaughan. Realism in a Combat Firing Course, Armor, January-February 1961, 12-16.

Haggard, Donald F. Training Methods for Simulators of Remote Control Human-Guided Missile Systems: 1. A Comparative Evaluation of Component Skill and Total Skill Training Exercises. Research Memorandum, HUMPRO Division 2, Fort Knox, Kentucky (FIREPOWER VII), July 1962. AD 463 442.

Hamilton, Charles E. Model Simulator Studies of the Visibility of Military Targets at Night. HumPRO Subcontractor's report (Project MICHIGAN), August 1958 (ARMORNITE 17). AD 679 197.

*Hunt, William T. Carry A Big Stick, Army Digest, November 1970, 25 (11), 60-61. (Shillelagh training).

Luton, G. A. G. Tank Crew Training with Simfire, International Defense Review, October 1971, 4, 442-444 (tank gunnery trainer).

Porter, Vonne F. et al. The Effect of Increased Subcaliber Substitution Training on 90mm Gunnery Proficiency. HumPRO Staff Memorandum, June 1964 (ARMORNITE 1). AD 480 427.

Spiller, E. and R. Hagedorn. Use of Motion Picture Film to Record Firing Accuracy from a Moving Platform. Technical Report 11576, Army Tank-Automotive Command (prepared by Pacific Car & Foundry Company, Renton, Washington), August 1963. AD 901 2242.

ARMOR Training Devices (Cont'd)

*Showan, S. R. Simulation for Tank/Anti-Tank Evaluation (STATE II) Concept and Model Description. Technical Memorandum STC TM-324, SHAPE Technical Centre, The Hague, The Netherlands (NATO), May 1972. AD 901 005.

Spieth, Walter. An Exploratory Study of Operator and Apparatus Characteristics of a Flexible Gunnery Research Device. Technical Report 52-2, Human Resources Research Center, Air Training Command, Lackland Air Force Base, San Antonio, Texas, October 1952.

Titl, Alfred. Training on Modern Tanks, Simulators Raise the Level of Training. U.S. Army Foreign Science and Technology Center, Technical Translation FSTC-HT-23-1413-71, 17 April 1972. Translation of brochure from Krauss-Maffei, Munich, West Germany, 1970. AD 894 699.

Titl, Alfred. Training with Modern Tanks: Simulators Raise Training Levels. U.S. Army Foreign Science and Technology Center, Charlottesville, Virginia, Technical Translation FSTC-HT-23-451-72, 1972. Translation of Soldat und Technik, 7/1970, West Germany, pp 382-387. AD 894 434.

University of Pittsburgh. Development of Hit Indicator for M48 and M60 Tanks, Device 3F43-3A. Interim Report, University of Pittsburgh, Pittsburgh, Pa. (sponsor: Army Materiel Command), November 1965. AD 475 161. (Simulates the functions of the main tank gun, "...reduces the amount of training ammunition required, and accurately evaluates crew proficiency". -- DDC abstract.)

University of Pittsburgh. Development of Sheridan Weapon System Conduct-of-Fire Trainer, XM35. Interim Report, University of Pittsburgh, Pittsburgh, Pa. (sponsor: Army Materiel Command), October 1965. AD 474 002. ("Trainer designed to help teach combat vehicle crewmen how to fire the Shillelagh guided missile as mounted in the XM551 Sheridan vehicle ..." -- DDC abstract).

U.S. Army Armor Board. Comparative Evaluation of Training Practice Rounds for 105-mm Tank Gun. Report, USAAB, Fort Knox, Kentucky, January 1963. AD 234 808.

U.S. Army Armor Board. Military Potential Test of German 14.5mm Sub-caliber Tank Gunnery Trainer. Partial Report No. 1, USAAB, Fort Knox, Kentucky, January 1965. AD 458 006L.

U.S. Army Armor School. Tank, Antitank and Assault Weapons Requirements Study (TATAWS-III), RECONARC Portion, Volume III, Annex 1--Evaluation of Training Aids (U). Final Draft, CONFIDENTIAL Report, USAAB, Fort Knox, Kentucky, June 1969. AD 802710.

Wright, Norman, Jr. et al. The Training Effectiveness of a Stereo Projector Trainer. HUMPRO Technical Report 12, October 1969.

AIR DEFENSE

Training

Armed Forces Journal. Stinger for Redeye, Armed Forces Journal, August 1972, p 26 (Cites deficiencies of REDEYE and introduction of STINGER to replace it. STINGER was formerly designated as REDEYE II).

*Army. Army Missiles in Service and Under Development, Army, June 1973, 22(6), 16-22.

Baldwin, Robert D. and Harry E. Anderson. Sources of Variability in Missile Unit Evaluations. HumRRO Technical Report 66-13 (VIGIL), June 1966. AD 636 776.

Chaparral Passes Test, Infantry, November-December 1966, 57-58.

Department of the Army. TF44-2758, Red Eye Air Defense Guided Missile System, Part 1 Introduction, training film, Color, 16 minutes, 1967. Launcher and missile components firing sequence associated equipment used with red eye and use in tactical situation. Emplacement on firing position and identification of firing on target.

Department of the Army. TF44-2924, The Hawk Battery Orientation and Alignment, Training film, Black and white, 28 minutes, 1964. Composition of a hawk battery. Principles and procedures for orienting and aligning major components. Battery control center radars illuminators and launchers.

Department of the Army. TF44-4133, Air Defense Artillery Weapons Systems Chaparral SP, Part 1 Introduction, The Chaparral Squad in Action, Training film, black and white, 28 minutes, 1967. A chaparral squad moves into a new position and organizes to provide area defense. The squad engages hostile enemy aircraft in defense of a convoy. The squad is then deployed against an enemy counterattack.

Department of the Army. TF44-4134, Air Defense Artillery Weapons Systems Chaparral SP Part 3, Target Engagement Techniques, Training Film, black and white, 20 minutes, 1970. Chaparral squad in places where fields of view are clear. Employs the FAAR and TADDS and visual surveillance to detect and identify enemy aircraft and engages single and multiple hostile targets.

AIR DEFENSE Training (Cont'd)

Department of the Army. TF 44-4135, Air Defense Artillery Weapons System Chaparral SP Part 2, Emplacement and Preparation for Action, Training film, black and white, 24 minutes, 1970. Shows how the chaparral squad occupies the weapon position, sets up command and observation posts, energizes and sets the weapon for operation, establishes communication.

Department of the Army. MF44-159, the ARADCOM Story, Film, Color, 10 minutes, 1963. Mission and operation of US Army Air Defense Command and demonstration of nuclear capabilities of Nike AJAX and Hercules as effective defense against air attacks.

*Department of the Army. AR 385-62. Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat. Army Regulation, 17 April 1967, with Change 1.

*Department of the Army. CTA 23-100-1. Ammunition, Rockets, and Missiles for Basic and Advanced Individual Training (by MOS). Common Tables of Allowances, 11 January 1972.

*Department of the Army. CTA 23-100-2. Ammunition, Rockets, and Missiles for CONUS Service School Training. Common Tables of Allowances, 11 January 1972.

*Department of the Army. CTA 23-100-6. Ammunition, Rockets, and Missiles for Unit Training -- Active Army and Reserve Components. Common Tables of Allowances, 11 January 1972.

Department of the Army. FM 23-17. REDEYE Guided Missile System. Field Manual, 22 October 1971.

Department of the Army. ASubjSed 23-17. REDEYE Gunner and Air Defense Section Training. Army Subject Schedule, 5 May 1972.

Geiger, George J. Air Defense Missiles for the Army, Military Review, December 1969, 49(12), 39-49, including US missiles, REDEYE and CHAPARRAL, pp 45-46.

Hitt, James D., Jr. and Robert D. Baldwin. Development and Use of Proficiency Tests for Nike System Launching Platoon Operators. HumRPO Technical Report 72 (VIGIL I), August 1961. AD 263 169.

Jackson, M. L. Redeye, Marine Corps Gazette, May 1971, 55(5), 47-48.

AIR DEFENSE Training (Cont'd)

Miller, Elmo E. System Analysis of Practical Exercise Instruction.
Interim Report. Interim Report IR-D5-73-1, HUMPRO Division No. 5,
Fort Bliss, Texas, April 1973. (Deals with HAWK maintenance training).

Palmer, Francis H. et al. Collected Papers Prepared Under Work Unit
AAA: Factors Affecting Efficiency and Morale in Antiaircraft Artil-
lery Batteries. HUMPRO Professional Paper 33-69, November 1969.
AD 699 490.

Williams, W. L., Jr. et al. An Analysis of the Redeye System with
Some Suggestions for Training. Research Memorandum, Human Resources
Research Office (Division 5?), December 1961. AD 379 523. (Ref: Re-
port Bibliography: Training for Live Fire (U). Defense Documentation
Center, Alexandria, Virginia, June 1973 (SECRET).

AIR DEFENSE

Training Devices

Baldwin, Robert D. et al. Aircraft Recognition Performance of Crew Chiefs with and without Forward Observers. HumRRO Technical Report 70-12 (SKYFIRE), August 1970. AD 714 213.

Baldwin, Robert D. Capabilities of Ground Observers to Locate, Recognize, and Estimate Distance of Low-Flying Aircraft. HumRRO Technical Report 73-8, March 1973.

Department of the Army. TF44-3602, Hawk Engagement Simulator AN/TPQ-21, Part 1 Introduction, training film, black and white, 25 minutes, 1966. How the AN/TPQ-21 is set up and used by hawk batteries for systematic training of control center operators.

Frederickson, E. W. and Robert J. Foskett. Small Arms Air Defense Training on a Reduced-Scale Range. Consulting Report (SKYFIRE), HumRRO Division No. 5, Fort Bliss, Texas, October 1966.

*Frederickson, E. W. et al. Methods of Training for the Engagement of Aircraft with Small Arms. HumRRO Technical Report 70-2, February 1970. AD 703 507. (SKYFIRE).

Hayes, Jack H. Initial Production Test of Redeye Moving Target Simulator (M-87). Final Report, Army Missile Test and Evaluation Directorate, White Sands Missile Range, New Mexico, April 1972. AD 900 913.

Jordan, Carroll R. Engineering Test of Redeye XM76 Training Set. Final Report. Army Missile Test and Evaluation Command, White Sands Missile Range, New Mexico, July 1969. AD 857 361L.

Jordan, Carroll R. Engineering Test of Redeye XM76 Training Set. Supplement to Final Report. Army Missile Test and Evaluation Command, White Sands Missile Range, New Mexico, October 1969. AD 862 040L.

Kopstein, F. F. and R. L. Morgan. Human Factors Considerations in the Design Proposals for a Ballistic Missile Unit Proficiency System. Technical Report 57-352, Wright Air Development Center, Wright-Patterson AFB, Ohio, December 1957. AD 142 040. (Cited, with annotations, in Valverde et al, 1973).

McCluskey, Michael R. et al. Studies on Training Ground Observers to Estimate Range to Aerial Targets. HumRRO Technical Report 68-5, May 1968. (SKYFIRE I). AD 669 963.

AIR DEFENSE Training Devices (Cont'd)

*McCluskey, Michael R. Studies on Reduced-Scale Ranging Training with a Simple Range Finder. HumRRO Technical Report 71-24, December 1971.

Marine Corps Development and Education Command. Redeye Launch Simulator Acceptance Test. Report, Marine Corps Development and Education Command, Quantico, Virginia, May 1971. AD 883 895L.

Moline, Michael J. Engineering Test of CHAPARRAL Simulator/Evaluator. Final Report, Army Missile Test and Evaluation Directorate, White Sands Missile Range, New Mexico, March 1971. AD 894 823L.

Norris, Charles L. Evaluation of the Deployment of a Lightweight Air Defense Weapons System (LADS); Redeye Launch Simulator (RELS). Field Test Report, Marine Corps Development and Education Command, Quantico, Virginia, August 1971. AD 887 159L.

*Spellman, E. A. Development of a Rocket-Blast Simulator: Design and Test. Technical Memorandum 4-64, Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, February 1964.

U.S. Army Air Defense Board. Service Test of the XM-46 Redeye Field Handling Trainer. U.S. Army Air Defense Board, Fort Bliss, Texas, Letter Report, July 1966. AD 487 151L.

Whitmore Paul G. and Don J. Friel. Supplementary Aircraft Recognition Training in Support of the Expedited Redeye Troop Test. Consulting Report, HumRRO Division No. 5, Fort Bliss, Texas, March 1967.

Whitmore Paul G. et al. A Classroom Method of Training Aircraft Recognition. HumRRO Technical Report 68-1 (STAR I), January 1968. AD 666 093.

Whitmore, Paul G. et al. Studies of Aircraft Recognition Training. HumRRO Technical Report 72-5, February 1972.

Wienke, J. E. and R. C. Montgomery. Determination of the Field of View of Block 1 and Block 3 Redeye Missile Launchers Sights. Consulting Report, HumRRO Division No. 5, Fort Bliss, Texas, February 1967.

INFANTRY

Training

*Armed Forces Journal. TOW Gets Shillelaghed? (with inset: Shillelagh Conversion Hit on House Floor), Armed Forces Journal, 18 April 1970, 107(31), page 8.

*Army. Army Missiles in Service and Under Development, Army, June 1973, 23(6), 16-22.

Baker, Robert A. et al. Development of Proficiency Tests for Basic Combat and Light Infantry Training. HumRRO Technical Report 19, July 1955. AD 85 829. (Work Unit PROFICIENCY).

Barkofsky, E. C. Engineering Test of XM47 (DRAGON) Weapon System. Part A (U). Army Missile Test and Evaluation Directorate, White Sands, New Mexico, September 1972. AD 522831L. (MICROFICHE) (CONFIDENTIAL).

Barkofsky, Ernest. Engineering Test of XM47 (DRAGON) Weapon System. Part B to Final Report (U). Army Missile Test and Evaluation Directorate, White Sands, New Mexico, September 1972. (CONFIDENTIAL). AD 522 832L.

Bearss, D. G. Redeye, Infantry, September-October 1961, 41-42.

Brinker, Walter E., Jr. Tank Killers, Infantry, July-August 1971, 61(4), 12-15. (Information primarily on training against tanks).

Caine, Bruce T. Antitank Tactics, Infantry, July-August 1973, 63(4), 32-37. (Practical TOW tactics for Europe).

Crawford, Letcher and Edgar R. McGreevy. Stumbling Block to Realistic Training, Infantry, Dec 60-Jan-Feb 1961, 46-47.

Dees, James W. et al. An Experimental Review of Basic Combat Rifle Marksmanship: MARKSMAN, Phase 1. HumRRO Technical Report 71-4, March 1971.

Defense Documentation Center. Small Arms Characteristics and Training. DDC, Alexandria, Virginia, Report Bibliography, 20 October 1972.

Donenberg, Victor H. and F. J. McGuigan. Evaluation of a Special Live-Firing Trigger-Squeeze Exercise. HumRRO Technical Report 6, May 1954. AD 32 656.

INFANTRY Training (Continued)

Department of the Army. TM 7-120, 81mm Mortar M29 Part 1 Mechanical Training, training film, Black & White, 15 minutes, 1961. Features components and tactical use of weapon, how mortar is mounted, how the sight M-34A2 is used to place the mortar on target.

Department of the Army. TM 7-3253, 81mm Mortar M29 Part 2, Sight Calibration and Laying the Section, training film, Black & White, 23 minutes, 1963. Calibrating sight for elevation and deflection, how aiming circle is used to lay mortars for accurate fire, loading and firing mortar at target.

Department of the Army. TM 7-3893, Weapons of the Infantry, training film, Color, 21 minutes, 1968. Characteristics, employment capabilities and limitations of M14, M14A1, M16A1, M79, M60, 50 caliber, M72 rocket, 3.5 rocket, 90mm and 106mm RR, 50 caliber spotting gun, 81mm and 4.2 inch mortars.

Department of the Army. AR 385-63. Regulations for Firing Ammunition for Training, Target Practice, and Combat. Army Regulation, 28 Feb 1973.

Department of the Army. FM 7-10. The Rifle Company, Platoons, and Squads. Field Manual, 17 April 1970, with Change 1.

Department of the Army. FM 23-3. Tactics, Techniques and Concepts of Antiarmor Warfare. Field Manual, 24 August 1972.

Department of the Army. FM 23-8. U.S. Rifle Caliber .30, M1. Field Manual, 17 May 1965.

Department of the Army. FM 23-7. Carbine, Caliber .30, M1, M1A1, M2, and M3. Field Manual, 9 January 1952, with Changes 1 and 2.

Department of the Army. FM 23-8. U.S. Rifle -- 7.62mm, M14 and M14A1. Field Manual, 7 May 1965, with Change 1.

Department of the Army. FM 23-9. Rifle, 5.56mm, M16A1. Field Manual, 27 March 1970.

Department of the Army. FM 23-11. 40mm Recoilless Rifle, M67. Field Manual, 6 July 1965, with Changes 2 and 3.

Department of the Army. FM 23-12. Technique of Fire of the Rifle Squad and Tactical Applications. Field Manual, 10 July 1967.

Department of the Army. FM 23-11. Browning Automatic Rifle, Cal.30, M1918A2. Field Manual, 1 July 1961.

INFANTRY Training (Cont'd)

Department of the Army. FM 23-16. Automatic Rifle Marksmanship. Field Manual, 23 June 1965, with Change 1.

Department of the Army. FM 23-35. Pistols and Revolvers. Field Manual, 24 September 1971.

Department of the Army. FM 23-41. Submachine Guns, Caliber .45, M3 and M3A1. Field Manual, 8 July 1957, with Change 1.

Department of the Army. FM 23-55. Browning Machineguns Caliber .30, M1919A6 and M37. Field Manual, 29 July 1965.

Department of the Army. FM 23-65. Browning Machinegun Caliber .50 HB, M2. Field Manual, 19 May 1972.

Department of the Army. FM 23-67. Machinegun 7.62mm, M60. Field Manual, 26 October 1964.

Department of the Army. FM 23-71. Rifle Marksmanship. Field Manual, 8 December 1966. with Changes 1-3.

Department of the Army. FM 23-72. Carbine Marksmanship Courses, TRAINFIRE I. Field Manual, 12 June 1958, With Change 1.

Department of the Army. FM 23-82. 106mm Recoilless Rifle, M40A1. Field Manual, 28 May 1964, with changes 1-3.

Department of the Army. FM 23-85. 60-mm Mortar, M19. Field Manual 2 February 1967.

Department of the Army. FM 23-90. 81mm Mortar. Field Manual, 25 February 1972.

Department of the Army. FM 23-91. Mortar Gunnery. Field Manual, 17 December 1971.

Department of the Army. FM 23-92. 4.2 inch Mortar, M30. Field Manual, 10 June 1970, with Change 1.

Department of the Army. TC 23-3. To Catch A Tank. Training Circular, 30 June 1972.

Department of the Army. TC 23-11. Starlight Scope, Small Hand-Held or Individual Weapons Mounted, Model No. 6060. Training Circular, 17 November 1966.

INFANTRY Training (Cont'd)

Department of the Army. TC 23-12. Target Detection: Crack and Trump Technique. Training Circular, 16 June 1966, with Change 1.

Department of the Army. TC 23-13. Crew-Served Weapon Night Vision Sight. Training Circular, 20 January 1967.

Department of the Army. TC 23-14. Sniper Training and Employment. Training Circular, 27 October 1969.

Department of the Army. TC 23-15. Engagement of Aerial Targets with Small Arms. Training Circular, 29 September 1969.

Department of the Army. TC 23-18. Night Observation Device, Medium Range (MODMR). Training Circular, 24 August 1967.

Department of the Army. TC 23-20. M16A1 Rifle Training. Training Circular, 31 August 1967.

Department of the Army. TC 23-21. Familiarization Firing Course: Armored Personnel Carrier M113 with Armament Kit. Training Circular, 29 August 1968.

Department of the Army. TC 23-22. 20mm Gun, M139, Vehicle Rapid Fire Weapon System. Training Circular, 30 December 1969.

Department of the Army. TC 23-23. TOW Heavy Antitank Weapon System. Training Circular, 9 July 1970, with Change 1.

Department of the Army. ATP 7-43. Rifle Company, Mechanized Infantry Battalion. Army Training Program, 11 July 1968.

Department of the Army. ATP 7-44. Combat Support Company, Airmobile and Light Infantry Battalion. Army Training Program, 18 July 1968.

Department of the Army. ATP 11-10. Male Military Personnel Without Prior Service. Army Training Program, 9 April 1970.

Department of the Army. ATP 7-2. Rifle Squad Tactical Training. Army Subject Schedule, 21 February 1968.

Department of the Army. ATP 7-3. Weapons Squad Tactical Training. Army Subject Schedule, 6 March 1968.

Department of the Army. ATP 7-7. 81mm Mortar Squad Tactical Training. Army Subject Schedule, 5 August 1967.

Department of the Army. ATP 7-8. Light Infantry Squad and Section Tactical Training. Army Subject Schedule, 15 July 1968.

INFANTRY Training (Cont'd)

Department of the Army. ASubjScd 7-27. Heavy Mortar Platoon Tactical Training. Army Subject Schedule, 1 April 1967.

Department of the Army. ASubjScd 23-5. Battalion Mortar and DAVY CROCKETT Platoon Mortar Qualification. Army Subject Schedule, 16 November 1962.

Department of the Army. ASubjScd 23-10. 3.5-inch Rocket Launcher, M20A1 and M20A1B1. Army Subject Schedule, 18 April 1966.

Department of the Army. ASubjScd 23-11. 90mm Recoilless Rifle, M67. Army Subject Schedule, 20 May 1966.

Department of the Army. ASubjScd 23-13. Crew-Served Weapon Night Vision Sight. Army Subject Schedule, 20 January 1967.

Department of the Army. ASubjScd 23-14. Automatic Rifle Marksmanship. Army Subject Schedule, 1 May 1967.

Department of the Army. ASubjScd 23-15. Engagement of Aerial Targets with Small Arms. Army Subject Schedule, 2 May 1968.

Department of the Army. ASubjScd 23-16. Sniper Training. Army Subject Schedule, 27 October 1969.

Department of the Army. ASubjScd 23-18. Night Observation Device, Medium Range (NODMR). Army Subject Schedule, 24 August 1967.

Department of the Army. ASubjScd 23-20. M16A1 Rifle Training. Army Subject Schedule, 31 August 1967.

Department of the Army. ASubjScd 23-24. Technique of Fire of the Rifle Squad during Periods of Limited Visibility. Army Subject Schedule, 19 February 1963.

Department of the Army. ASubjScd 23-29. Hand Grenades. Army Subject Schedule, 9 April 1970.

Department of the Army. ASubjScd 23-35. Machinegun, 7.62mm, M60 or Browning Machinegun, Caliber .30, M1919A6. Army Subject Schedule, 22 Aug 1962.

Department of the Army. ASubjScd 23-36. Combat Firing and Close Combat. Army Subject Schedule, 10 August 1967.

Department of the Army. ASubjScd 23-37. 40mm Grenade Launcher M79. Army Subject Schedule, 21 July 1965.

Department of the Army. ASubjScd 23-39. Starlight Scope, Small Hand-Held or Individual Weapons Mounted, Model No. 6060. Army Subject Schedule, 17 November 1966.

INFANTRY Training (Cont'd)

Department of the Army. ASubjSed 23-71. Rifle Marksmanship. Army Subject Schedule, 29 October 1966, with Change 1.

Department of the Army. ASubjSed 23-72. M16A1 Rifle Marksmanship. Army Subject Schedule, 19 May 1970.

Department of the Army. ASubjSed 23-82. 106mm Recoilless Rifle M40A1. Army Subject Schedule, 16 August 1966.

Department of the Army. ATT 7-15. Infantry Battalion. Army Training Test, 8 September 1966.

Department of the Army. ATT 7-16-1. Heavy Mortar Platoon, Headquarters and Headquarters Company, Infantry, Airborne Infantry, and Mechanized Infantry Battalions, Mortar Platoon, Combat Support Company, Airmobile, and Light Infantry Battalions. Army Training Test, 29 January 1971.

Department of the Army. ATT 7-18. Rifle Company Infantry and Light Infantry Battalions. Army Training Test, 17 November 1966, with Change 1.

Department of the Army. ATT 7-37. Rifle Company, Airborne Infantry Battalion. Army Training Test, 17 November 1966, with Change 1.

Department of the Army. ATT 7-45. Mechanized Infantry Battalion. Army Training Test, 22 April 1971.

Department of the Army. ATT 7-47. Rifle Company, Mechanized Infantry Battalion. Army Training Test, 14 March 1966, with Change 1.

Department of the Army. ATT 7-55. Airmobile Infantry Battalion. Army Training Test, 24 January 1968.

Department of the Army. ATT 7-57. Rifle Company, Airmobile Infantry Battalion. Army Training Test, 11 July 1969.

Department of the Army. TOE 7-100. Rifle Company, Infantry Battalion, Infantry Division, or Rifle Company, Infantry Battalion, Separate Infantry Brigade. Table of Organization and Equipment, 30 November 1970, with Changes 1-4.

Department of the Army. TOE 7-35H. Infantry Battalion (Airborne), Airborne Division, or Infantry Battalion (Airborne), Separate Airborne Brigade. Table of Organization and Equipment, 30 November 1970.

INFANTRY Training (Cont'd)

Department of the Army. TOE 7-45H. Infantry Battalion (Mechanized), Armored Division or Infantry Battalion (Mechanized), Infantry Division or Infantry Battalion (Mechanized), Infantry Division (Mechanized) or Infantry Battalion (Mechanized), Separate Armored Brigade or Infantry Battalion (Mechanized), Separate Infantry Brigade (Mechanized). Table of Organization and Equipment, 30 November 1970..

Department of the Army. TOE 7-47H. Rifle Company, Infantry Battalion (Mechanized), Armored Division or Rifle Company, Infantry Battalion (Mechanized), Infantry Division or Rifle Company, Infantry Battalion (Mechanized), Infantry Division (Mechanized), Separate Armored Brigade or Rifle Company, Infantry Battalion (Mechanized), Separate Infantry Brigade (Mechanized). Table of Organization and Equipment, 30 November 1970, with Change 1-4.

Department of the Army. TOE 7-48H. Combat Support Company, Infantry Battalion (Mechanized), Armored Division or Combat Support Company, Infantry Battalion (Mechanized), Infantry Division or Combat Support Company, Infantry Battalion (Mechanized), Infantry Division (Mechanized) or Combat Support Company, Infantry Battalion (Mechanized), Separate Armored Brigade or Combat Support Company, Infantry Battalion (Mechanized), Separate Infantry Brigade (Mechanized). Table of Organization and Equipment, 30 November 1970, with Changes 1-3.

Department of the Army. TOE 7-57H. Rifle Company, Infantry Battalion Airmobile Division. Table of Organization and Equipment, 31 December 1971, with Change 1.

Department of the Army. TOE 7-58H. Combat Support Company Infantry Battalion, Airmobile Division. Table of Organization and Equipment, 31 December 1971 with Change 1.

Department of the Army. CTA 20-2. Equipment for Training Purposes. Common Tables of Allowances, 11 July 1969.

Department of the Army. CTA 23. Targets and Target Equipment. Common Tables of Allowances, 15 December 1969.

* Department of the Army. CTA 23-100-1. Ammunition, Rockets, and Missiles for Basic and Advanced Individual Training (by MOS). Common Tables of Allowances, 11 January 1972.

* Department of the Army. CTA 23-100-2. Ammunition, Rockets, and Missiles for CONUS Service School Training. Common Tables of Allowances, 11 January 1972.

* Department of the Army. CTA 23-100-4. Ammunition for Training -- USAR Schools and ARNG State Officer Candidate Schools. Common Tables of Allowances, 11 January 1972.

* Department of the Army. CTA 23-100-6. Ammunition, Rockets, and Missiles for Unit Training -- Active Army and Reserve Components. Common Tables of Allowances, 11 January 1972.

INFANTRY Training (Cont'd)

Department of the Army. TM 9-1000-205-12. Operator and Organizational Maintenance Manual: Rifle, Recoilless, 106mm: M40A2 (FSN 1015-133-3424) and M40A4 (FSN 1015-133-8485). Technical Manual, 5 March 1959, with Changes 1-5.

Department of the Army. TM 9-1005-249-10. Operator's Manual: M16A1 Rifle. Technical Manual, May 1972.

Department of the Army. TM 9-1015-223-12. Operator and Organizational Maintenance Manual: Rifle, Recoilless 90mm: M67 (1015-657-7534). Technical Manual, 2 February 1962, with Changes 1-5.

Department of the Army. TM 9-1015-223-244. Combined Organizational, 12, and 13, Repair Parts and Special Tools List for Rifle, Recoilless 90mm: M67 (1015-657-7534). Technical Manual, 16 September 1968.

Department of the Army. TM 9-1425-470-ESG. Equipment Serviceability Criteria for TOW Heavy Antitank/Assault Weapon System. Technical Manual, 5 March 1970.

Department of the Army. TM 9-1425-470-12. Operator's and Organizational Maintenance Manual for TOW Heavy Antitank/Assault Weapon System. Technical Manual, 3 February 1972.

Department of the Army. TM 9-1425-470-34. Direct Support and General Support Maintenance Manual for TOW Heavy Antitank/Assault Weapon System. Technical Manual, 1 April 1971.

Bruckner, Arthur J. et al. Strengths and Deficiencies of Precombat Training as Reported by Infantrymen in Korea. PRS Report 954, Personnel Research Section. The Adjutant General's Office, Washington, D.C., 1962.

Butcher, Robert J. Year of the DRAGON, Infantry, May-June 1971, p 16.

Chen, H. R. Proven -- the Opposing Forces Test, Infantry, July-August 1971, p 30-31.

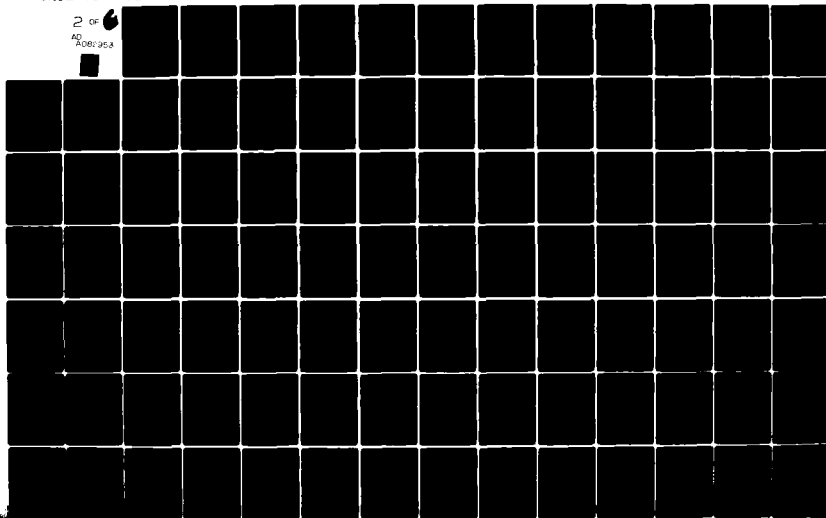
Conrad, John L. and Joseph S. Ward. Training Implications, Extended Field Use, Infantry Rifle Unit Study, EPSC-75 (IKCS 1183), Consulting Engineers, Gumpf Division No. 3, Presidio of Monterey, California, November 1966. (FOR INTERNAL USE ONLY).

Conrad, R. I. et al. The Combat Subjects and Corresponding Proficiency Levels Related to the 1968 Training Program for the Light Weapons Infantryman (MOS 111.0). Research Memo and/or CRIFMAN 11.1, 11.2, 11.3, 11.4, Fort Benning, Georgia, December 1968. AD 478 244.

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AD A082 953



INFANTRY Training (Cont'd)

*Frederickson, E. W. et al. Methods of Training for the Engagement of Aircraft with Small Arms. HumRRO Technical Report 70-2, February 1970. AD 703 507. (SKYFIRE).

Gereau, R. N. The One-One-Two Craze: What's a Basic Soldier Trained in Heavy Weapons Supposed to Know? Army, February 1961, 72+.

Green, F. A. Training Can Have More Realism, Marine Corps Gazette, October 1961, 66.

Greer, George and Benjamin W. White. Achievement in Basic Training. Staff Memorandum, HumRRO Division No. 2, Presidio of Monterey, California, 4 July 1955.

Gschwind, Robert T. Gunners' Aiming Errors in Antitank Weapons. Technical Memorandum 5-64, Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, 1964.

Hammes, John A. et al. TRAINFIRE II: A New Course in Basic Technique of Fire and Squad Tactics. HumRRO Technical Report 41, July 1957. AD 140 445.

Hathaway, John F. The Hand-Held 81mm Mortar, Infantry, September-October 1967, 40+.

Hope, Arthur C. Integrated Engineering and Service Test of TOW Heavy Antitank/Assault Weapon System, Tropic Phase (U). Final Report, TOW Report 18, Army Missile Test and Evaluation Directorate, White Sands, New Mexico, February 1972. AD 520 211L. (CONFIDENTIAL).

HumRRO Division No. 4. Training for Small Independent Action Forces. Program Description No. 9: Use of Individual Weapons. HumRRO By-Product RBP-D4-71-9 (SIAF), HumRRO Division No. 4, Fort Benning, Georgia (sponsor: Advanced Research Projects Agency), 1971.

HumRRO Division No. 4. Training for Small Independent Action Forces. Program Description No. 10: Use of Machineguns. HumRRO By-Product RBP-D4-71-10 (SIAF), HumRRO Division No. 4, Fort Benning, Georgia (sponsor: Advanced Research Projects Agency), 1971.

International Defense Review. The TOW (Tube-launched, Optically-tracked, Wire-guided) Anti-Tank Missile System, International Defense Review, March 1970, 3, 84-87.

INFANTRY Training (Cont'd)

Kelly, Henry E. Infantry Combat Training. In Henry E. Kelly. The Collected Papers of COL Henry E. Kelly. Fort Benning, Georgia: HumRRO Division No. 4, compiled 1965, reissued 1966, pp 73-77. Published in Infantry, November-December 1962, 52(6).

Kelly, Henry E. More Battle Drill, Infantry, January-February 1972, p 17.

McFann, Howard H. et al. TRAINFIRE I: A New Course in Basic Rifle Marksmanship. HumRRO Technical Report 22, October 1955. AD 89 606.

McIntyre, F. M. A Human Factors Engineering Evaluation of the SS-11 Antitank Guided Missile. Technical Memorandum 16-60, Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, 1960.

Mann, Hal G. Aggressor: A New Appraisal of an Old Enemy, Infantry, July-August 1972, 42-44.

Marshall, S. L. A. Infantry Operations and Weapons Usage in Korea, Winter of 1950-51. Operations Research Office, Johns Hopkins University, Chevy Chase, Maryland, 1951.

Martin, Carl. Redeye, Army Digest, June 1967, 48.

Osteen, John L., Jr. Dynamic Training for Rifle Squads, Infantry, 1971, 61(6), p 32.

Olmstead, Joseph A. The Effects of "Quick Kill" upon Trainee Confidence and Attitudes. HumRRO Technical Report 68-15, December 1968. AD 682 350.

Olmstead, Joseph A. and T. O. Jacobs. The Effects of Changes in Transition Firing upon "Quick Kill" Proficiency. HumRRO Technical Report 69-44, July 1969. AD 692 930.

Patch, W. A. Report of CONARC Liaison Visit to RVN, USAIS Representative. U.S. Army Infantry School, Fort Benning, Georgia, 6 February 1970. (FOR OFFICIAL USE ONLY).

Patrick, Burton D. Expanded Service Test of Medium Antitank/Assault Weapon Surface Attack Guided Missile System, XM 47 (DRAGON). Final Report on USAIB Project 3166, U.S. Army Infantry Board, Fort Benning, Georgia, November 1972. (CONFIDENTIAL).

INFANTRY Training (Cont'd)

Platoon Tactics Committee, U.S. Army Infantry School. Assault Training-- Right or Wrong? Infantry, July-August 1963, 3-6. (Advantages of the use of live fire).

Second Infantry Division. Survey of Actual Time Individual Soldier Participates in Training. 2d Infantry Division, Fort Benning, Georgia, 23 February 1962.

Shepherd, Richard D. Antitank Defense: A Centralized Approach, Infantry, March-April 1973, 63(2), 21-24 (Employment of TOW-- suggests formation of an antitank battalion equipped with TOW).

Staff, Subtask, RIFLEMAN I. Critical Combat Skills, Knowledges, and Performances Required of the 1962 Light Weapons Infantryman (MOS 111.0). Research Memorandum, HumRRO Division No. 4, Fort Benning, Georgia, January 1961. AD 634 513.

Stewart, Steve. Ability Definitions and Scales for Rating DRAGON Gunner Performance. Reference Manual, HumRRO Division No. 4, Fort Benning, Georgia, May 1973 (FOR INTERNAL HUMRRO USE ONLY).

Talbott, Orwin C. Gun or Guided? An Evaluation of Our Antiarmor Weapons, Infantry, March-April 1973, 63(2), 6-11. (Includes Shillelagh and TOW).

Taylor, Curtis O. Simulated Tactical Tests of the DRAGON Antitank Rocket (XM-47 System)(U). Report RT-TR-71-18, U.S. Army Missile Command, Redstone Arsenal, Alabama, September 1971. AD 519 486. (CONFIDENTIAL).

Torre, J. P., Jr. Human Factors Affecting Rifle Accuracy in Automatic and Semiautomatic Fire (U). Technical Memorandum 11-63, Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, 1963. (CONFIDENTIAL).

Torre, James P., Jr. and Richard R. Kramer. The Effects of Stress on the Performance of Riflemen. Technical Memorandum 5-66, U.S. Army Human Engineering Laboratories, Aberdeen Proving Ground, Maryland, May 1966 (Downgraded from CONFIDENTIAL to UNCLASSIFIED 31 December 1972).

U.S. Army Combat Development Experimentation Center. Rifle Company-- Live Fire Experiment. USACDEC, Fort Ord, California, 1 February 1962.

U.S. Army Infantry Agency. The DRAGON Cost and Effectiveness Analysis (U). U.S. Army Infantry Agency, Fort Benning, Georgia, (SECRET). AD 520 092.

INFANTRY Training (Cont'd)

U.S. Army Infantry School. Rifle Squad and Platoon Evaluation Program, 22 May 1961-31 July 1961. U.S. Army Infantry School, Fort Benning, Georgia, 1961. (FOR OFFICIAL USE ONLY).

U.S. Army Infantry School. Infantry Instructors' Conference, 15-19 July 1963, Report of. USAIS, Fort Benning, Georgia, 1963.

U.S. Army Infantry School. Infantry Instructors Workshop: Report of Conference. USAIS, Fort Benning, Georgia, 17-20 August 1965.

U.S. Army Infantry School. Antitank Guided Missile Handbook. USAIS, Fort Benning, Georgia, February 1967.

U.S. Army Infantry School. Redeye Guided Missile Handbook. USAIS, Fort Benning, Georgia, July 1967.

U.S. Army Infantry School. Battalion Weapons Training Packet (Mortar). USAIS, Fort Benning, Georgia, December 1970.

U.S. Army Infantry School. Infantry Reference Data, Vols 1 and 2. Special Text 7-157 (FY 72), U.S. Army Infantry School, Fort Benning, Georgia, 1971.

U.S. Army Infantry School. TOW Weapon System Instructor Packet. USAIS, Fort Benning, Georgia, April 1971.

U.S. Army Infantry School. Introduction to the TOW Weapon System Programmed Text. U.S. Army Infantry School, Fort Benning, Georgia, 7 April 1971.

U.S. Army Infantry School. Antiarmor Study. USAIS, Fort Benning, Georgia, January 1972.

U.S. Army Infantry School. Program of Instruction for 2-7-F1, Branch Immaterial Officer Candidate Course. U.S. Army Infantry School, Fort Benning, Georgia, May 1973.

U.S. Army Infantry School. Program of Instruction for 2-7-C1(M), Infantry Officer Mobilization Basic Course (and) 2-7-C1, Infantry Officer Basic Course (Nonresident/Resident). U.S. Army Infantry School, Fort Benning, Georgia, May 1972.

U.S. Army Infantry School. Program of Instruction for 0-1A-C40A, Infantry Armor (1A-CMF) NCO Basic (USAIS) Course. U.S. Army Infantry School, Fort Benning, Georgia, November 1972.

INFANTRY Training (Cont'd)

U.S. Army Infantry School. Program of Instruction for 2-7-C20, Infantry Officer Basic Course (Draft). U.S. Army Infantry School, Fort Benning, Georgia, February 1973.

• U.S. Army Infantry School. Program of Instruction for 2-7-C22, Infantry Officer Advanced Course. U.S. Army Infantry School, Fort Benning, Georgia, August 1972.

• U.S. Army Infantry School. Program of Instruction for 2E-1543/010-F1, Infantry Mortar Platoon Course. U.S. Army Infantry School, Fort Benning, Georgia, August 1972.

U.S. Army Infantry School. Program of Instruction for 2-7-F2, Infantry Officer Candidate (Reserve Components) Course. U.S. Army Infantry School, Fort Benning, Georgia, October 1972.

U.S. Army Infantry School. Program of Instruction: 2-7-C23(M), Infantry Officer Mobilization Advanced Course (and) 2-7-C23, Infantry Officer Advanced Course (Nonresident/Resident). U.S. Army Infantry School, Fort Benning, Georgia, August 1972.

U.S. Army Missile Command. Information Booklet TOW Guided Missile System. USAMC, Redstone Arsenal, Alabama, 19 November 1969.

*Volz, Joseph. One Missile Program Too Many? Armed Forces Journal, 21 March 1970, 107(27), p. 14 (compares TOW and Shillelagh).

Weapons Department, USAIS. Characteristics of Infantry Weapons. Weapons Department, U.S. Army Infantry School, Fort Benning, Georgia, June 1965.

Weapons Department, USAIS. Small Arms Handbook WS-1. Weapons Department, U.S. Army Infantry School, Fort Benning, Georgia, January 1966.

• Weislogel, Robert L. and John C. Flanagan. The Job of the Combat Infantryman. Technical Memorandum, Operations Research Office, Johns Hopkins University, Chevy Chase, Maryland, 18 September 1953.

• Weller, Jac. 20th Century Rifle? Infantry, July-August 1973, 63(4), 13-17.

White, M. E. A Realistic Requalification Course, Marine Corps Gazette, August 1956, 32+.

INFANTRY Training (Cont'd)

Woodward, Billy R. Look at TOW, Infantry, July-August 1970, p. 43.

Yakshe, John S. Redeye: Ground to Air, Infantry, July-August 1966, 22-23.

*Zierdt, John G. Stop that Tank! Ordnance, May-June 1965, p 621+.
(Includes TOW).

INFANTRY

Training Devices

Brundiek, Hans. Military Potential Test of Subcaliber Training Device for M16A1 Rifle. Final Letter Report. Report APG-MT-4089 (Sponsor: U.S. Army Small Arms Systems Agency), Aberdeen Proving Ground, Maryland, June 1972. AD 900 623L.

Bryant, Charles L. Mortars and Mirrors: A Limited Facility Training Aid, Infantry, January-February 1972, 62(1), 42-44 (reprinted from Infantry, April 1957). Includes specifications for building a Bryant Mortar Training Device.

Bynam, Holland E. The FTX (Field Training Exercise), Infantry, November-December 1968, 40-46.

Caine, Bruce T. Infantry Training in an Armored Division, Infantry, March-April 1973, 63(2), 28-31. (Combat Training exercise for mechanized Infantry including MECHANDO training concept).

Clovis, E. R. et al. A Study of Training Device Requirements to Support Land Combat Training -- Final Report. Volume I of III (Recruit Training). Technical Report NAVTRADEVCEEN 69-C-0215-1 (prepared by Litton Systems, Inc., Monterey, California), Naval Training Device Center, Orlando, Florida, April 1971. AD 894 317L.

Clovis, E. R. et al. A Study of Training Device Requirements to Support Land Combat Training -- Final Report. Volume II of III (Individual Combat Training/Basic Specialist Training). Technical Report NAVTRADEVCEEN 69-C-0215-2, (prepared by Litton Systems, Inc., Monterey, California) Naval Training Device Center, Orlando, Florida, April 1971. AD 894 318L.

Cook, John P. Pneumatic Mortar Trainer, Infantry, May-June 1972, p. 57.

Gregory, Walter and Robert Tibuni. Engineering Test of Training Set, Guided Missile, XM-70, for TOW Heavy Antitank/Assault Weapon System. Final Report, TOW Report 19, Army Missile Test and Evaluation Directorate, White Sands Missile Range, New Mexico, June 1972. AD 903 948L.

Heatherington, Billy W. TOW Weapon System XM-70 Training Set Check Test for the TOW Blast Simulator Diaphragm. Report RT-TR-72-20, U.S. Army Missile Command, Redstone Arsenal, Alabama, August 1972. AD 904 199L.

INFANTRY Training Devices (Cont'd)

Heatherington, Billy W. Test Evaluation Report TOW Weapon System Qualification Test Program for the XM-70 Training Set Blast Simulators. Technical Report 1 August-22 September 1972, Test and Evaluation Directorate, Army Missile Command, Redstone Arsenal, Alabama, November 1972. AD 908 664L.

Karr, A. C. A Tank Tracking Simulator for Human Engineering Studies. Report R-1594, Frankford Arsenal Research and Development Group, Philadelphia, Pennsylvania, June 1961.

Kennon, J. W. Live Firing Exercise, Marine Corps Gazette, October 1955, 39-41.

Klein, Ronald D. Infantry Weapons Test Methodology Study, Quick-Fire Experiment I. Final Report. U.S. Army Infantry Board, Fort Benning, Georgia (prepared by Litton Systems, Inc.), 27 June 1969.

McCluskey, Michael R. Studies on Reduced-Scale Ranging Training with a Simple Range Finder. HumRRO Technical Report 71-24, December 1971.

McFann, Howard H. et al. Realistic Targets for the Training and Testing of Combat Riflemen. Staff Memorandum (TRAINFIRE I), HumRRO Division No. 4, Fort Benning, Georgia, April 1955. AD 489 296.

McGuigan, Frank J. The Relationship between 1000" Range and Known-Distance Range Rifle Scores. Research Memorandum 3, Human Resources Research Organization, Alexandria, Virginia, 1953. AD 23 851.

Marshall, A. H. and G. A. Siragusa. Gallium Arsenide Injection Laser Diode Quick Kill Weapon Fire Simulator. Physical Sciences Laboratory, Naval Training Device Center, Orlando, Florida, November 1969. AD 863 027. (MICROFICHE).

Neal, Barney K., Jr. Firecracker Board, Infantry School Quarterly, April 1956, 97-100.

Newton, Robert D. The Opposing Forces Test: A Realistic Approach to the ATT, Infantry, October-November 1960, 56-59.

Nichols, T. F. et al. Performance Evaluation of Light Weapons Infantrymen (MOS 111.0), Graduates of the Advanced Individual Training Course (ATP 7-17). HumRRO Technical Report 81, December 1962 (RIFLE-MAF III). AD 294 179. (Evaluation exercise simulated the first 21 months of combat experienced by replacements assigned to a rifle squad).

INFANTRY Training Devices (Cont'd)

Ramond, Charles K. and Charles R. Mighell. Target Placement on a Detection Proficiency Course. Staff Memorandum (TRAINFIRE I), HumRRO Division No. 4, Fort Benning, Georgia, June 1954. AD 489 292.

*Showan, S. R. Simulation for Tank/Anti-Tank Evaluation (STATE II) Concept and Model Description. Technical Memorandum STC TM-324, SHAPE Technical Centre, The Hague, The Netherlands (NATO), May 1972. AD 901 005.

U.S. Army Infantry Board. Service Test of Subcaliber Mortar Training Device, M19. USAIB, Fort Benning, Georgia, USAIB-2842, June 1959. AD 309 153.

U.S. Army Infantry Board. Infantry Small Arms Methodology Review (Rifle). Final Report. U.S. Army Infantry Board, Fort Benning, Georgia, July 1971.

U.S. Army Infantry Board. Infantry Weapons Test Methodology Study, Final Report, Volume II. Antitank Weapons Test Methodology. U.S. Army Infantry Board, Fort Benning, Georgia, 17 January 1972.

U.S. Army Infantry Board. Infantry Weapons Test Methodology Study, Final Report, Volume III. Light Machine Gun Test Methodology. U.S. Army Infantry Board, Fort Benning, Georgia, June 1972.

U.S. Army Infantry Board. Infantry Weapons Test Methodology Study, Final Report, Volume IV, Grenade Launcher Test Methodology. U.S. Army Infantry Board, Fort Benning, Georgia, April 1972.

U.S. Army Infantry Board. Infantry Weapons Test Methodology Study, Final Report, Volume V. Indirect Fire Weapons Test Methodology. U.S. Army Infantry Board, Fort Benning, Georgia, 1 June 1972.

U.S. Army Infantry Board. Infantry Weapons Test Methodology Study: Integrated Operational Test and Analysis Procedures for Small Arms Weapons Systems Evaluation. Report, U.S. Army Infantry Board, Fort Benning, Georgia, May 1972.

Voss, Harold A. et al. Prototype Instinctive Firing Training Device for Small Arms. Human Factors Laboratory, Naval Training Device Center, Orlando, Florida, April 1970. AD 873 014. (MICROFICHE).

Ward, Joseph S. et al. Combat in Built Up Areas: A Two-Hour Course in Clearing Buildings. Working Paper of Draft Prototype Report, HumRRO Division 3, Presidio of Monterey, California, September 1965. (FOR INTERNAL USE ONLY.).

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APPENDIX A

INFANTRY, BRIEF SURVEY

.45 Cal. Pistol, M1911A1

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		.2		
Demonstration		.2		
Practical Exercise		3.0		
Peer Instruction		.6		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: _____				
Total Hours of Instruction		4		

INFANTRY

.45 Cal. Pistol, M1911A1

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device				
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures				
Printed Material				
Television				
Motion Pictures				
Actual Equipment		3.8		
Instructor		.2		
Other _____				
Totals		4.0		

INFANTRY

.45 Cal. Pistol, M1911A1

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				
INDIVIDUAL DRILL				
Live Fire				
Ball		50*		
Tracer		120**		
Simulated Fire				
Blank				
Dry Fire		Instructional Firing .2 hrs		

* Rounds per trainee.

** Rounds per Company.

Infantry

.45 Cal. Pistol, M1911A1

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100%		
Type of Evaluation				
Paper and pencil				
Hands-On, Part Task		100%		
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification				

Infantry

.45 Cal. Pistol, M1911A1

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:12		
Time Period Over Which Instruction Is Scheduled		1 day		
Total Hours Allocated For Course		4		
Hours For Training		2.8		
Hours For Evaluation		1.2		

INFANTRY
M16A1 Rifle

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference	2.6	.2		
Demonstration	6.5	3.5		
Practical Exercise	35.5	10.4	72 FTX	*
Peer Instruction	4.5	9.3		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: <u>Hands-On</u>	27.9			
Total Hours of Instruction	73 WPN 3 TAC	23.4 WPN 20.6 TAC		

* Depends on local training situation.

INFANTRY

M16A1 Rifle

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device	4			
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures				
Printed Material				
Television				
Motion Pictures				
Actual Equipment	67.5	23.2	100%	100%
Instructor	4.5	.2		
Other _____				
Totals	76	23.4		

INFANTRY

M16A1 Rifle

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire		12-5.56mm*		
Ball		800-5.56mm**		
		3232-5.56mm***		
Tracer		740-5.56mm**		
		384-5.56mm***		
Simulated Fire		600-5.56mm**		
Blank		1152-5.56mm***		
Dry Fire				
INDIVIDUAL DRILL				
Live Fire				
Ball	638-5.56mm*		650**	416****
	146-5.56mm**			
Tracer	10-5.56mm*			
	40-5.56mm**			
Simulated Fire	36-5.56mm*		1620**	468****
Blank	461-5.56mm**			
Dry Fire	Instructional Firing 6 hrs			

*Rounds per Trainee.

**Rounds per Company.

*Rounds per Squad.

****Rounds per Battalion.

Infantry
M16A1 Rifle

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	- BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)	100%	100%		
Type of Evaluation				
Paper and pencil				
Hands-On, Part Task	40%	40%		
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification	60%	60%		

Infantry

M16A1 Rifle

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee			
	BCT	AIT	- BUT	AUT
Evaluation of Firing Proficiency				
Crew Performance				
Live Fire				
Simulated Fire				
Dry Fire				
Individual Perform- ance				
Live Fire - Ball	148-5.56mm* 4-5.56mm*			
Tracer				
Simulated Fire				
Dry Fire				

*Rounds per Trainee.

Infantry

M16A1 Rifle

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio	Pd 1- 1:220 Pds 1-17,21-23 - 1:55	1:55		
Time Period Over Which Instruction Is Scheduled	2 weeks	2 weeks	8 days	
Total Hours Allocated For Course	76	23.4	98	
Hours For Training	65	22.4	72	
Hours For Evaluation	11	1.0	26	

Transportation and Maintenance	Costs Per Mile For Moving Personnel To and From Range Area
44 passenger bus \$.15 per mile each - 5 required	\$.75
5-ton tractor and passenger van \$.33 each - 3 required	\$.99
2½-ton truck (33 passenger) \$.16 each - 7 required	\$ 1.12

INFANTRY

M203 Grenade Launcher

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference	.6	.1		
Demonstration	.2	.3		
Practical Exercise	.2	3	72 FTX	*
Peer Instruction	.3	.6		
Instructor Guidance and Critique With Small Group				
Individualized (self-paced)				
Group Paced				
Self-paced				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: Hands-On	.9			
Total Hours of Instruction				

INFANTRY

M203 Grenade Launcher

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device				
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures	.7	.2		
Printed Material				
Television				
Motion Pictures				
Actual Equipment	2.7	3.7		
Instructor	.6	.1		
Other _____				
Totals	4.0	4.0		

INFANTRY

M203 Grenade Launcher

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				
INDIVIDUAL DRILL				
Live Fire	2 HE*			
	3 PRAC*			
	2 BL**		40**	
	3 PRAC**			
Tracer				
Simulated Fire			30**	
Blank				
Dry				
	Instructional Firing	Instructional Firing		
	3 hrs	3 hrs		

Approved by: [Signature]
8 June 1968

Infantry

M203 Grenade Launcher

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)	100%	100%		
Type of Evaluation				
Paper and pencil				
Hands-On, Part Task	100%			
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment		40%		
Qualification		60%		

Infantry

M203 Grenade Launcher

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee			
	BCT	AIT	BUT	AUT
Evaluation of Firing Proficiency				
Crew Performance				
Live Fire				
Simulated Fire				
Dry Fire				
Individual Performance				
Live Fire-Ball		3 PRAC, 9 HE*		
Tracer		3 PRAC, 9 HE		
Simulated Fire				
Dry Fire				

*Rounds per Trainee.

**Rounds per Company

Infantry

M203 Grenade Launcher

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio	1 hr- 1:220 1 hr- 1:30 2 hrs- 1:110	1:55		
Time Period Over Which Instruc- tion Is Scheduled	1 day	1 day		
Total Hours Allo- cated For Course	4	4		
Hours For Training	3.2	2		
Hours For Evalua- tion	.8	2		

INFANTRY

M60 Machinegun

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference	.6	.9		
Demonstration	.4	5.6		
Practical Exercise	1	22	72 FTX	100%
Peer Instruction	1.5	3.5		
Instruction for Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Hands-On	2.5			
Total Hours of Instruction	6	32		

Infantry

M60 Machinegun

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)	100%	100%		
Type of Evaluation				
Paper and pencil				
Hands-On, Part Task	100%	60%		
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification		40%		

Infantry

M60 Machinegun

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee			
	BCT	AIT	BUT	AUT
Evaluation of Firing Proficiency				
Crew Performance				
Live Fire-Ball				
Simulated Fire				
Dry Fire				
Individual Perform- ance				
Live Fire		186*	650**	450****
Simulated Fire (Blank)		138*		
Dry Fire			2200**	2000****

*Rounds per Trainee.

**Rounds per Company.

****Rounds per Battalion.

INFANTRY

M60 Machinegun

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device				
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures	.4	.2		
Printed Material				
Television				
Motion Pictures				
Actual Equipment	5	31.1	100%	100%
Instructor	.6	.7		
Other _____				
Totals	6	32		

INFANTRY

M60 Machinegun

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire		140-MLB*		
Ball		100-MLB**		
Tracer		398-MLB-TR-1*		
Simulated Fire		100-MLB-TR4**		
Blank		4550-MLB-TR**		
Dry Fire				
INDIVIDUAL DRILL				
Live Fire				
Ball	100*			
Tracer	600**			
Simulated Fire				
Blank				
Dry Fire	Instructional Firing 1 hr			

* Rounds per trainee.

** Rounds per company.

Infantry

M60 Machinegun

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)	100%	100%		
Type of Evaluation				
Paper and pencil				
Hands-On, Part Task	100%	60%		
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification		40%		

Infantry

M60 Machinegun

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee			
	BCT	AIT	BUT	AUT
Evaluation of Firing Proficiency				
Crew Performance				
Live Fire-Ball				
Simulated Fire				
Dry Fire				
Individual Perform- ance				
Live Fire		186* 138*	650**	450****
Simulated Fire (Blank)			2200**	2000****
Dry Fire				

*Rounds per Trainee.

**Rounds per Company.

****Rounds per Battalion.

Infantry

M60 Machinegun

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio	1 hr- 1:75 5 hrs- 1:55	1:55		
Time Period Over Which Instruc- tion Is Scheduled	1 Day	2 weeks	3 days	
Total Hours Allo- cated For Course	6	32		
Hours For Training	4.5	23.2	72	
Hours For Evalua- tion	1.5	8.8	26	

INFANTRY

.50 Cal. Machinegun

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		.3		
Demonstration		1.2		
Practical Exercise		4.5		
Peer Instruction		1		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Journal				
Computer Aisted Instruction				
Programmed Instruction				
Notes				
Total Hours of Instruction		7		

INFANTRY

.50 Cal. Machinegun

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device				
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures		.2		
Printed Material				
Television				
Motion Pictures				
Actual Equipment		5.3		
Instructor		.5		
Other _____				
Totals		6.0		

INFANTRY

.50 Cal. Machinegun

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball		106-.50 Cal.* TR4-1 MLB		
Tracer		100-.50 Cal.** TR MLB		
Simulated Fire				
Blank				
Dry Fire		Instruction- al Firing 1 hr		
INDIVIDUAL DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				

*Rounds per Trainee.

**Rounds per Company.

Infantry

.50 Cal. Machinegun

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100%		
Type of Evaluation				
Paper and pencil				
Hands-On, Part Task		100%		
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification				

Infantry

.50 Cal. Machinegun

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:55		
Time Period Over Which Instruc- tion Is Scheduled		2 days		
Total Hours Allo- cated For Course		7		
Hours For Training		6		
Hours For Evalua- tion		1		

INFANTRY

81mm Mortar

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		3.2		
Demonstration		13.6		
Practical Exercise		21.2	72 FTX	*
Peer Instruction		63		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: _____				
Total Hours of Instruction		108	72	

*Depends on local training situation.

INFANTRY

81mm Mortar

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device		3		
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures		1		
Printed Material				
Television				
Motion Pictures				
Actual Equipment		102.5		
Instructor		1.5		
Other _____				
Totals		108		

INFANTRY

81mm Mortar

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
HE		10.3* 9**	135**	24****
WP		9**	32**	9****
ILL		2*	32**	
Simulated Fire				
Blank				
Dry Fire		Instruction- al Firing 35 hrs		
INDIVIDUAL DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				

*Rounds per Trainee.

**Rounds per Company.

****Rounds per Battalion.

Infantry

81mm Mortar

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100%	100%	100%
Type of Evaluation				
Paper and pencil				
Hands On, Part Task				
Performance With Training Devices				
Crew Drill, Gunner's Test		100%		
Integrated Test of Terminal Per- formance require- ment				
Qualification				

Infantry

81mm Mortar

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:11		
Time Period Over Which Instruction Is Scheduled		3 weeks		
Total Hours Allocated For Course		108		
Hours For Training		96		
Hours For Evaluation		12		

INFANTRY

4.2-Inch Mortar

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		.4		
Demonstration		1.3		
Practical Exercise		5.8		*
Peer Instruction		4.5		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: _____				
Total Hours of Instruction		12		

*Depends on local training situation.

INFANTRY

4.2-Inch Mortar

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device				
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures		1		
Printed Material				
Television				
Motion Pictures				
Actual Equipment		10.6		100%
Instructor		.4		
Other _____				
Totals		12		

INFANTRY

4.2-Inch Mortar

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire		2-4.2"HE* 25-4.2"HE**		24-HE***** 9-WP*****
Ball				
Tracer				
Simulated Fire		Instruction- al Firing 3 hrs		
Blank				
Dry Fire				
SECTION DRILL				
Live Fire				
Tracer				
Simulated Fire				
Blank				
Dry Fire				

*Rounds per Trainee.
 **Rounds per Company.
 *****Rounds per Battalion.

Infantry

4.2-Inch Mortar

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)				
Type of Evaluation				
Paper and pencil				
Hands On, Part Task				
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment		100%		
Qualification				

Infantry

4.2-Inch Mortar

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:11		
Time Period Over Which Instruction Is Scheduled		1 week		
Total Hours Allocated For Course		12		
Hours For Training		12		
Hours For Evaluation				

INFANTRY

90mm Recoilless Rifle

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		.8		
Demonstration		2.3		
Practical Exercise		8	72 FTX	*
Peer Instruction		1.9		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: _____				
Total Hours of Instruction		13		

*Depends on local training situation.

INFANTRY

90mm Recoilless Rifle

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device		5		
Audio Tape Recds				
Transparencies				
Filmstrips				
Still Pictures		.5		
Printed Material				
Television				
Motion Pictures				
Actual Equipment		7.5		100%
Instructor				
Other _____				
Total		13.0		

INFANTRY

90mm Recoilless Rifle

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball			16***	
Tracer				
Simulated Fire				
Blank				
Dry Fire				
INDIVIDUAL DRILL				
Live Fire				
Ball		3-90mm, HEAT* 6-90mm, HEAT**		
Tracer				
Simulated Fire		91-7.62* 49-7.62** (Subcaliber)		
Blank		Instructional Firing		
Dry Fire		2 hrs		

*Rounds per Trainee.

**Rounds per Company.

***Rounds per WPN.

Infantry

90mm Recoilless Rifle

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100%		
Type of Evaluation				
Paper and pencil				
Hands On, Part Task				
Performance With Training Devices				
Crew Drill, Gunner's Test		40%		
Integrated Test of Terminal Per- formance Require- ment				
Qualification		60%		

Infantry
90mm Recoilless Rifle

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee			
	BCT	AIT	BUT	AUT
Evaluation of Firing Proficiency				
Crew Performance				
Live Fire				
Simulated Fire				
Dry Fire				
Individual Perform- ance				
Live Fire		84-7.62mm*		
Simulated Fire		(Qualifica- tion)		
Dry Fire				

*Rounds per Trainee.

Infantry
90mm Recoilless Rifle

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:12		
Time Period Over Which Instruc- tion Is Scheduled		1 week		
Total Hours Allo- cated For Course		13		
Hours For Training		10.4		
Hours For Evalua- tion		2.6		

INFANTRY

106mm Recoilless Rifle

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	ALT	BUT	AUT
Lecture				
Conference		1.6		
Demonstration		6.5		
Practical Exercise		24.9	72 FTX	*
Peer Instruction		4.0		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: _____				
Total Hours of Instruction		37		

*Depends on local training situation.

INFANTRY

106mm Recoilless Rifle

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device		14.5		
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures		.5		
Printed Material				
Television				
Motion Pictures				
Actual Equipment		22.0		100%
Instructor				
Other _____				
Totals		37		

INFANTRY

106mm Recoilless Rifle

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball		2-106mm, APERS* 1-106mm, HEAT** 8-106mm, HEAT**	75 WPN**	8****
Tracer		58-.50 Cal.+ 30-.50 Cal.++		
Simulated Fire		108-.30 Cal.* 54-.30 Cal.*		
Blank		65-.30 Cal. TR 45-.30 Cal. TR (Subcaliber)		
Dry Fire		Instructional Firing 6 hrs		
INDIVIDUAL DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				

*Rounds per Trainee.

**Rounds per Company.

***Spotter Rounds per Trainee.

****Spotter Rounds per Company.

*****Rounds per Battalion.

Infantry

106mm Recoilless Rifle

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100%		
Type of Evaluation				
Paper and pencil				
Hands-On, Part Task		40%		
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification		60%		

Infantry
106mm Recoiless Rifle

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee			
	BCT	AIT	BUT	AUT
Evaluation of Firing Proficiency				
Crew Performance				
Live Fire- Ball		52-.30 Cal*		
Tracer		31-.30 Cal*		
		36-.30 Cal**		
Spotter		17-.50 Cal*		
		20-.50 Cal**		
Individual Perform- ance				
Live Fire				
Simulated Fire				
Dry Fire				

*Rounds per Trainee.

**Rounds per Company.

Infantry
106mm Recoiless Rifle

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:12		
Time Period Over Which Instruc- tion Is Scheduled		2 weeks		
Total Hours Allo- cated For Course		37		
Hours For Training		27		
Hours For Evalua- tion		10		

INFANTRY

M72A2, LAW

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference	.2	.1		
Demonstration		.1		
Practical Exercise	.7	1.2		
Peer Instruction	.4	.6		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: <u>Hands-On</u>	2.7		72 FTX	
Total Hours of Instruction	4	2		

INFANTRY

M72A2, LAW

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device	1.2	.1		
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures				
Printed Material				
Television				
Motion Pictures				
Actual Equipment	2.8	1.7		
Instructor		.1		
Other _____		.1		
Totals	4.0	2.0		

INFANTRY

M72A2, LAW

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				
INDIVIDUAL DRILL				
Live Fire				
Ball	2-66mm, HEAT**	1-66mm, HEAT* 2-66mm, HEAT**		
Tracer				
Simulated Fire	3-35mm, M73* (Subcaliber)	2-35mm* 2-35mm** (Subcaliber)		
Blank				
Dry Fire	Instructional Firing .2 hrs	Instructional Firing .6 hrs		

*Rounds per Trainee.

**Rounds per Company.

Infantry

M72A2, LAW

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)	100%	100%		
Type of Evaluation				
Paper and pencil				
Hands-On, Part Task	100%	100%		
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification				

Infantry

M72A2, LAW

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio	1 hr- 1:20 1 hr- 1:110 2 hrs- 1:73	1:44		
Time Period Over Which Instruc- tion Is Scheduled	1 day	1 day		
Total Hours Allo- cated For Course	4	2		
Hours For Training	3	1.6		
Hours For Evalua- tion	1	.4		

INFANTRY

TOW

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		2.5		
Demonstration		6.5		
Practical Exercise		19		
Peer Instruction		5		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: _____				
Total Hours of Instruction		33		

INFANTRY

TOW

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device		16		
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures		1.0		
Printed Material				
Television				
Motion Pictures				
Actual Equipment		16		100%
Instructor				
Other _____				
Totals		33		

INFANTRY

TOW

Practical Exercises	Amount of Practice			
	BCT	AIT	BIT	AUT
CREW DRILL				
Live Fire				
Blank				
Drill				
Simulated Fire		18 hrs		
Blank				
Drill				
INDIVIDUAL DRILL				
Live Fire				
Blank				
Drill				
Simulated Fire				
Blank				
Drill				

Infantry

TOW

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)		100%		
Criterion Referenced (go/no go)				
Type of Evaluation				Score of 70 on evaluation
Paper and pencil		5%		10%
Hands On, Part Task		20%		10%
Performance With Training Devices		75%		40%
Crew Drill, Gunner's Test				40%
Integrated Test of Terminal Per- formance require- ment				
Qualification				

Infantry

TOW

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee			
	BCT	AIT	BUT	AUT
Evaluation of Firing Proficiency				
Crew Performance				
Live Fire				
Simulated Fire		3 hrs, XM- 70 training set		
Dry Fire				
Individual Perform- ance				
Live Fire				
Simulated Fire				
Dry Fire				

Infantry

TOW

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:35		1:4
Time Period Over Which Instruc- tion Is Scheduled		1 week		
Total Hours Allo- cated For Course		33		16
Hours For Training		28		11
Hours For Evalua- tion		5		5

Infantry

Facilities and Fiscal Support For Training	Weapon System		
	.45 Pistol	M16A1 Rifle	M203 Grenade Launcher
Weapon Cost			
Initial	\$57.00	\$117.00	\$89.32
Weapon or Barrel Life In Terms of Rounds	5,000	10,000	1,000
Ammunition Cost Per Round			\$2.14 HE \$2.68 PRACTICE
Ball	\$.06	\$.09	
Tracer		\$.08	
Blank		\$.06	
Approximate Sizes of Ranges Required For Training			
Tactical Exercises (maneuvers)		2000m x 2000m	
Live Firing			
Field Fire	200m x 50m	200m x 300m	200m x 300m
25m Range		200m x 50m	
Record Fire		500m x 300m	
Night Fire		200m x 100m	
Target Detection		200m x 400m	
Close Combat		200m x 300m	
Squad Tactics		1000m x 500m	
Number of Support Personnel Required For Live Firing			
Direct			
Target Acquisition			
Communication	1	1	1
Indirect			
Range Support			
Medical	1	1-4	1

Infantry

Facilities and Fiscal Support For Training	Weapon System	
	M60	.50 Cal
Weapon Cost		
Initial	\$708.00	\$1,026.00
Weapon or Barrel Life In Terms of Rounds	20,000	5,000
Ammunition Cost Per Round		\$.39-.50 Cal. TR4-1
Ball	.22	
Tracer	.11	
Blank	.08	
Approximate Sizes of Ranges Required For Training		
Tactical Exercises (maneuvers)		
Live Firing		
Field Fire	1000m x 1100m	1100m x 1000m
10m Range	200m x 50m	
MG Transition Range	750m x 800m	
Day Defensive Fld Fire	1100m x 1000m	
Predetermined Fire Range	440m x 550m	
Assault Fire	150m x 200m	
Number of Support Personnel Required For Live Firing		
Direct		
Target Acquisition		
Communication	1	1
Indirect		
Range Support		
Medical	1	1

Infantry

Facilities and Fiscal Support For Training	Weapon System	
	81mm	4.2 Inch
Weapon Cost		
Initial	\$2,333.00	\$5,212.00
Weapon or Barrel Life In Terms of Rounds		
Ammunition Cost Per Round	\$20.59-81mm, HE \$21.20-81mm, WP \$27.66-81mm, ILLUM \$21.77-81mm, TP	\$32.19-4.2" HE \$40.53-4.2" WP
Tracer		
Blank		
Approximate Sizes of Ranges Required For Training		
Tactical Exercises (maneuvers)		
Live Firing		
Field Fire	6000m x 300m(approx)	6000m x 3000m (approx)
25m Range		
Record Fire		
Night Fire		
Target		
Close Combat		
Number of Support Personnel Required For Live Firing		
Direct		
Target Acquisition		
Communication	1	1
Indirect		
Range Support		
Medical	1	1

Infantry

Facilities and Fiscal Support For Training	Weapon System	
	90mm	106mm
Weapon Cost		
Initial	\$2,758.00	\$7,933.00
Weapon or Barrel Life In Terms of Rounds	2000	2500
Ammunition Cost Per Round	\$40.48-90mm, HEAT	
Ball		\$.07, .30 Cal.
Spotter		\$1.02, .50 Cal.
Tracer	.11-7.62mm	\$.12, .30 Cal.
HEAT		\$63.11, 106mm
APERS		\$333.00, 106mm
ILLUM		\$27.66, 81mm
Approximate Sizes of Ranges Required For Training		
Tactical Exercises (maneuvers)		
Live Firing		
Field Fire	600m x 200m	1200m x 1000m
1000-Inch Range		200m x 100m
Training Field		200m x 200m
Night Fire		
Target		
Close Combat		
Number of Support Personnel Required For Live Firing		
Direct		
Target Acquisition		
Communication	1	2
Indirect		
Range Support		
Medical	1	1

Infantry

Facilities and Fiscal Support For Training	Weapon System	
	M72A2	TOW
Weapon Cost		
Initial	\$39.11	\$37,000.00
Weapon or Barrel Life In Terms of Rounds		Indefinite
Munition Cost Per Round	\$48.52-66mm, HEAT \$ 6.99-35mm, SUB-CAL.	\$6,555 HEAT \$7,217 PRACTICE
Ball		
Tracer		
Blank		
Approximate Sizes of Ranges Required For Training		
Gun Drills		200m x 500m
Live Firing		
Field Fire	200m x 300m	
25m Range		
Record Fire		
Night Fire		
Target		
Close		
Number of Support Personnel Required For Live Firing		
Direct		
Target Acquisition		
Communication	1	1
Indirect		
Range Support		
Medical	1	1

Infantry

Army Training Test - Unit Training

Proficiency Measurement	Percent of Total Evaluation		
	.45 Pistol	M16A1 Rifle	M203 Grenade Launcher
Type of Measure			
Norm Referenced			
Criterion Referenced		100%	
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee		
	.45 Pistol	M16A1 Rifle	M203 Grenade Launcher
Crew Performance			
Live Fire			
Simulated Fire			
Dry Fire			
Individual Performance			
Live Fire-Ball		40/WPN(Company Exercise)	44**
Simulated Fire-Blank		120/WPN(Company Exercise)	18**
Dry Fire			

*Rounds per Trainee.

**Rounds per Company.

Infantry

Army Training Test - Unit Training

Proficiency Measurement	Percent of Total Evaluation			
	M60	.50 Cal	81mm	4.2 Inch
Type of Measure				
Norm Referenced				
Criterion Referenced	100%		100%	100%
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee			
	M60	.50 Cal	81mm	4.2 Inch
Crew Performance				
Live Fire	500*		8 HE**** 3 WP****	8 HE**** 3 WP****
Simulated Fire	500*		18 HE** 8 WP**	
Dry Fire				
Individual Performance				
Live Fire	500*			
Simulated Fire	400*			
Dry Fire				

*Rounds per Trainee.

**Rounds per Company.

***Rounds per Battalion.

Infantry

Army Training Test - Unit Training

Proficiency Measurement	Percent of Total Evaluation			
	90mm	106mm	M72A2	TOW
Type of Measure				
Norm Referenced				
Criterion Referenced	100%	100%		
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee			
	90mm	106mm	M72A2	TOW
Crew Performance				
Live Fire-Tracer	2*	4****		
Simulated Fire				
Dry Fire				
Individual Performance				
Live Fire				
Simulated Fire				
Dry Fire				

*Rounds per Trainee.

****Rounds per Battalion.

Infantry

Operational Readiness Training Test - Unit Training

Proficiency Measurement	Percent of Total Evaluation		
	.45 Pistol	M16A1 Rifle	M203 Grenade Launcher
Type of Measure			
Norm Referenced			
Criterion Referenced			
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee		
	.45 Pistol	M16A1 Rifle	M203 Grenade Launcher
Crew Performance			
Live Fire-Ball		300*****	
Tracer		200*****	
Simulated Fire-Blank		225*****	
Dry Fire			
Individual Performance			
Live Fire- Ball			15 HE*****
Simulated Fire			15 PRAC*****
Dry Fire			

Rounds per Weapon.

Infantry

Operational Readiness Training Test - Unit Training

Proficiency Measurement	Percent of Total Evaluation			
	M60	.50 Cal	81mm	4.2 Inch
Type of Measure				
Norm Referenced				
Criterion Referenced				
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee			
	M60	.50 Cal	81mm	4.2 Inch
Crew Performance				
Live Fire	3200*****		80 HE***** 40 ILLUM***** 24 WP*****	78 HE***** 12 ILLUM***** 5 WP*****
Simulated Fire				
Dry Fire				
Individual Performance				
Live Fire				
Simulated Fire				
Dry Fire				

*****Rounds per Weapon.

Infantry

Operational Readiness Training Test - Unit Training

Proficiency Measurement	Percent of Total Evaluation			
	90mm	106mm	M72A2	TOW
Type of Measure				
Norm Referenced				
Criterion Referenced				
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee			
	90mm	106mm	M72A2	TOW
Crew Performance				
Live Fire	***** 24 HEAT	3 HEAT*****		
Simulated Fire	***** 1 APERS	1 APERS*****		
Dry Fire				
Individual Performance				
Live Fire				
Simulated Fire				
Dry Fire				

*****Rounds per Weapon.

DESCRIPTION OF TRAINING DEVICE FOR THE

81mm Mortar

Level of Training	ALT
Title and Nomenclature of Training Device	Pneumatic Mortar Trainer, M2 or M2A1
Description of Training Device	A pneumatically operated unit designed to accept a 9.2 in. 60mm. or 81mm mortar to fire a 20mm projectile on a 500 yd, 1000 in, or 2000 in range. It has a compressed gas extender, nose assembly, and 25 training projectiles. A blank .22 caliber round in the projectile explodes on impact to provide a puff of smoke for spotting purposes.
Course of Instruction	Primary ALT
Title	Indirect Fire Crewman MOS 11C10
Total Minutes of Instruction	Course Hours = 338 81mm Mortar Training Min = 108
Number of Instructional Devices	5
Total Amount of Time Required for Instruction	3 hours = 180 min. All trainees observe firing and compare fire charts.
Range, Location, and Weather Conditions	Period 1 of 81mm mortar training (atmospheric)
Method of Instruction	Instruction is for firing, determining wind direction and velocity, computing elevation, spot rounds for range, deviation, correction, spotting, to correct wind, elevation, bracketing and spotting.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>6%</p> <p>40%</p> <p>54%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

DESCRIPTION OF TRAINING DEVICE FOR THE

66mm HEAT Rocket, M72A2 LAW

Level of Training	BCT
Title and Nomenclature of Training Device	XM190 Subcaliber Tube
Description of Training Device	The XM190 is placed inside an expended LAW round. It is designed to fire the XM73 35mm subcaliber round. The XM73 is detonated by percussion at point of impact. The primer cap and primer train on the subcaliber round are similar to those employed on the standard LAW.
Course of Instruction Utilizing Training Device	ATP 21-114, Male Military Personnel without prior service
Title	Basic Combat Training
Total Number of Hours	Course Hours - 360 LAW Training Hours - 4
Number of Instructional Hours Scheduled for Training Device	1 1/4
Total Amount of Time Each Trainee Uses Device	25 minutes
Phase, Period, or Block of Course Where Device Is Used	Period 2, Station 2 Period 3, Station 1
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Targets stationary and moving targets at varying ranges from three positions under realistic firing conditions using a subcaliber device.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>40%</p> <p>60%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

DESCRIPTION OF TRAINING DEVICE FOR THE

66mm HEAT Rocket, M72A2 LAW

Level of Training	AIT
Title and Nomenclature of Training Device	XM190 Subcaliber Tube
Description of Training Device	The XM190 is placed inside an extended LAW round. It is designed to fire the XM73 35mm subcaliber round. The XM73 is detonated by percussion at point of impact. The primer cap and primer train on the subcaliber round are similar to those employed on the standard LAW.
Course of Instruction Utilizing Training Device	Infantry AIT
Title	Light Weapons Crewman MOS11B10
Total Number of Hours	Course Hours - 332 LAW Training Hours - 2
Number of Instructional Hours Scheduled for Training Device	1
Total Amount of Time Each Trainee Uses Device	10 minutes
Phase, Period, or Block of Course Where Device is Used	Period 2
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Engage stationary and moving targets at varying ranges. Fire subcaliber device from three positions.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>70%</p> <p>30%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

DESCRIPTION OF TRAINING DEVICE FOR THE
90mm Recoilless Rifle

Level of Training	AIT
Title and Nomenclature of Training Device	M49A1 7.62 Subcaliber Gun
Description of Training Device	The M49A1 consists of a long cylindrical sleeve, a barrel, bushing, locknut, firing pin, and attaching hardware. The barrel has holes in it permitting the cartridge case to be blown out. The 7.62 trajectory is about the same as the 90mm round.
Course of instruction Utilizing Training Device	Infantry AIT
Title	Direct Fire Crewman MOS 11H10
Total Number of Hours	Course Hours - 335 90mm RCLR Training Hrs. - 13
Number of Instructional Hours Scheduled for Training Device	6
Total Amount of Time Each Trainee Uses Device	3
Phase, Period, or Block of Course Where Device is Used	Periods 3, 5, and 6
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Provides practice in laying and firing the 90mm RCLR at various types of targets. The blast effect from holes in barrel gives training in this aspect of firing.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>67%</p> <p>11%</p> <p>22%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

DESCRIPTION OF TRAINING DEVICE FOR THE
100mm Recoilless Rifle

Level of Training:	AIT
Title and Nomenclature of Training Device	M9 .30 Caliber Subcaliber device for the 100mm RCLR
Description of Training Device	The trainer consists of a 106mm cartridge case without projectile, with a modified .30 caliber machine gun barrel and breech assembly inserted. The caliber .30 machinegun barrel has holes in it to reduce the muzzle velocity and produce a blast like the 106 RCLR. The sub-caliber round is inserted and extracted by hand. The device is 2 ft 1 in. long.
Course of Instruction Utilizing Training Device	Infantry AIT
Title	Direct Fire Crewman, MOS 11B10
Total Number of Hours	Course Hours - 335 100mm RCLR Training Hrs - 37
Number of Instructional Hours Scheduled for Training Device	15
Total Amount of Time Each Trainee Uses Device	6 Hours
Phase, Period, or Block of Course Where Device is Used	Periods 6, 7, 9, 10, 11, 12, and 14
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Provide practice in laying and firing the 100mm RCLR at various targets. Blast effect provides training in this aspect of firing.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>55%</p> <p>8%</p> <p>37%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

DESCRIPTION OF TRAINING DEVICE FOR THE
TOW

Level of Training	AIT
Title and Nomenclature of Training Device	XM70 TOW Training Set
Description of Training Device	The training set consists of an instructor console, a target set, and a missile simulation round. The instructors set has a monitoring capability to evaluate the response and tracking performance of the TOW gunner. The target source generates an infrared beam from which target tracking error information is provided as the target is tracked by the TOW gunner. The missile simulation is the same size, shape, and weight as the tactical TOW missile.
Course of Instruction Utilizing Training Device	Follow-on training on TOW for selected Infantry AIT Direct Fire Crewman MOS 11H10
Title	TOW Gunner MOS 11H10
Total Number of Hours	33
Number of Instructional Hours Scheduled for Training Device	16
Total Amount of Time Each Trainee User Device	5 hours as gunner, crew member in remaining time.
Phase, Period, or Block of Course Where Device is Used	Periods 3, 7, 8 and 10
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Provide TOW gunner indoctrination, tracking instruction, practice and qualification with the TOW weapon system.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>64%</p> <p>1% (1 live round)</p> <p>35%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

APPENDIX B

INFANTRY

DESCRIPTION OF WEAPONS TRAINING FOR THE 81mm MORTAR AND HEAVY ANTITANK WEAPON, TOW

INTRODUCTION

81mm MORTAR

Description of Weapon System. The 81mm mortar is a smooth bore, muzzle loaded, high angle of fire weapon. The weapon components consist of a cannon, bipod mount, and a baseplate. The cannon consists of a barrel, mount attachment ring and a spherical projection for attachment to the baseplate. The firing pin is located in the spherical projection and can be removed by removal of a base plug.

The bipod mount consists of the bipod legs, clamping collar for the cannon, and an elevating and traversing mechanism. It provides the movable support for the weapon and contains shock absorbers to absorb recoil when the weapon is fired.

The baseplate is of one-piece construction. It supports the base of the cannon for firing and absorbs recoil.

The mortar uses five types of ammunition:

1. High Explosive (HE), for use against personnel.
2. White Phosphorus (WP), for signaling, screening, incendiary, and casualty producing.
3. Illuminating (ILL), for battlefield illumination and signaling during darkness and periods of poor visibility.
4. Training Practice (TP), for training use only.
5. An inert Training Cartridge for training in loading and firing.

The maximum effective range of the weapon is 4700 meters. The system weight is approximately 95 lbs. and it is crew-served by a crew of five men. The mortar is layed and fired using the M53 or M34A2 sight unit which attaches to the bipod by means of a dove

tail slot. A boresighting device M45 for calibration of deflection and elevation is used prior to firing. The weapon is initially positioned using an M2 compass or an M2 aiming circle. Additional equipment includes aiming stakes for sighting the weapon and a night-sighting kit for use in firing at night.

Tactical Mission. The tactical mission of the 81mm mortar is to provide close and continuous indirect fire support to the Infantry unit. In the offense, the 81mm mortar fires preparatory fires, and fires in support of the scheme of maneuver. In the defense, it provides fires on long-range targets in support of the COP; fires within the battle area; close defensive fires; and final protective fires. Harassing and interdictory fires may be fired.

Current Army Organization of Weapons and Personnel. The 81mm mortar is currently assigned to the weapons platoon of the Infantry company. One weapon is organic to each of the three 81mm mortar squads. The mortar squad is composed of a squad leader, gunner, assistant gunner, first ammunition handler, and second ammunition handler. The squad leader commands the squad and supervises all its activities. The gunner manipulates the mortar when firing, and sets the sight for deflection and elevation. The assistant gunner loads the mortar and assists the gunner in shifting when large deflection changes are required. The first ammunition handler prepares the ammunition for firing and passes it to the assistant gunner. The second ammunition handler maintains the ammunition and its supply for firing, and provides local security for the mortar position.

Tactical Employment. Based on the general location designated by the company commander, the section leader normally selects the general position for each squad. The squad leader usually selects the exact site of the mortar.

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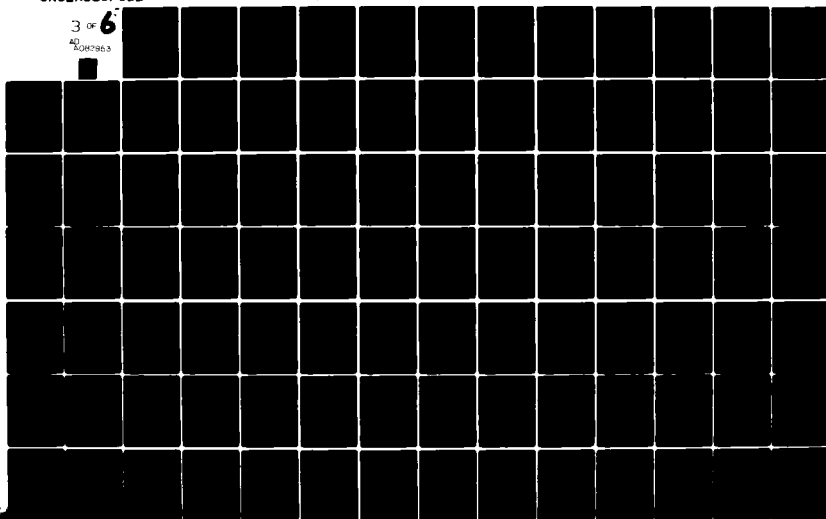
HUMAN RESOURCES RESEARCH ORGANIZATION ALEXANDRIA VA F/G 5/9
SURVEY OF ARMY WEAPONS TRAINING AND WEAPONS TRAINING DEVICES.(U)
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In selecting the firing position, the section leader concurrently considers a position that affords the following: (1) maximum coverage for the company area, (2) cover and concealment, (3) mask and overhead clearance, (4) dispersion between squads, (5) firm ground and access roads, and (6) security.

The mortar section is employed in one of three roles; general support, direct support, and attached.

In the general support role, the mortar section provides support to all or a major portion of the company. The company commander designates priority of fires, and controls the section through the platoon leader.

In the direct support role, the mortar section's primary responsibility is delivering fires in support of one of the assigned platoons. Direct support is seldom employed at rifle company level, and attachment is avoided when possible.

As an attached unit, control of the mortar section is passed from the parent unit to the unit receiving the attachment. The receiving unit commander then utilizes the section in the general support role or direct support role, as he sees fit.

HEAVY ANTITANK WEAPON (TOW)

Description of Weapon System. The TOW weapon system is a crew-portable ground and vehicle-mounted heavy antitank weapon. It consists of a launcher containing five basic components; the tripod, missile guidance set, traversing unit, optical sight, and launch tube. The system has internal tracking and missile control capabilities. The missile is tube-launched, optically-tracked, wire-command link guided, and is issued encased in a launch container which becomes part of the launch tube when fired. The system can be employed in all weather conditions, and under any condition that permits the gunner to see his target through the optical sight. The missile can be launched from a ground mount (tripod-mounted) or from

a vehicle mount which has been adapted to three standard Army vehicles: the M113 Armored Personnel Carrier (APC), the M151A1 1/4 ton truck, and the M274 1/2 ton Weapons Carrier (Mule). The TOW is primarily an antitank weapon designed to provide long range engagement of all known armored vehicles; however, it also provides a long range assault capability against heavily fortified bunkers, and gun emplacements. The maximum effective range of the TOW is 3000 meters.

Tactical Mission. The tactical mission of the TOW weapon system is to provide Infantry units with a long range, mobile, and accurate anti-armor capability. The TOW can also be used in a support role as a direct fire weapon against bunkers, gun emplacements, and fortified positions when required.

Current Army Organization of Weapons and Personnel. The TOW weapon system is currently located in the battalion antitank platoon and the Infantry Rifle Company. There are 12 in each Airborne Infantry battalion and 18 in all other Infantry battalions. Each rifle company has three weapons with the remainder located in the battalion antitank platoon.

The TOW crew contains four men; a squad leader, a gunner, an assistant gunner, and a driver/ammunition bearer.

The squad leader controls the actions of his elements to accomplish the assigned mission. He observes, acquires targets, and controls the employment of the weapon.

The gunner engages the target by firing and guiding the missile to the target, using the optical sight.

The assistant gunner loads and assists the gunner in making major shifts of the weapon.

The driver/ammunition bearer is responsible for the assigned vehicle, and the resupply of ammunition to the TOW.

Tactical Employment. There are three primary methods of employing the TOW antitank weapon in the Infantry battalion: general support, direct support and attached.

In the general support mission, the commander retains control over his weapons and makes their fires available on call to any subordinate unit. The battalion antitank platoon is the general support element. Under certain circumstances, the battalion commander may combine the TOW sections of the rifle companies and utilize them in general support of the battalion. Weapons held in general support are assigned sectors of fire within the battalion area. Similarly, the company commander may employ his TOW weapons in general support of his company or he may attach weapons to his rifle platoons or provide direct support to one or more platoons in the scheme of maneuver.

In the defense, the weapons of the battalion antitank platoon are generally employed throughout the battalion area under the control of the battalion commander, along the most likely avenues of enemy armor into the battalion position. Likewise, the rifle company commander employs his organic TOW along the most likely armor approaches into the company area. TOW weapons may be included in the combat outpost forward of the main battle elements to take advantage of their long range capability. However, fields of fire and terrain will influence the positioning of the heavy antitank weapons to take maximum advantage of their long range capabilities against enemy armor.

In the attack, the TOW will usually accompany the assaulting elements of mounted Infantry and will remain on commanding terrain in an over-watch position during dismounted operations.

TRAINING CONTENT

Task Analysis Procedures. The current procedure being used to conduct a task analysis for new or improved weapon systems follows

a chronological path of development. A requirement document, variously called in recent years a Qualitative Material Requirement (QMR), Material Need (MN), or Required Operational Capability (ROC), is written which establishes the physical and performance requirements desired in the system. From this requirement document, a development program is established which will provide a system possessing all or most of the physical and performance characteristics. The weapon developer provides a preliminary operating and maintenance manual (POMM) when the system is delivered for test. This POMM serves as the initial operator's manual and is later revised as the Field Manual (FM) and/or the Technical Manual (TM). The POMM contains procedures for training developed by the contractor which serve as the basis for the initial training program. Early tests at the Service School and the developmental tests provide experience on which to base the development of the initial training program. If the new weapon is an improved version of an existing system, the existing training program is usually modified to accommodate the peculiarities of the new system.

In the case of new weapon systems, the initial training program is developed by experienced personnel using the operational and training data obtained from tests. This data is obtained by observation, trial usage of the weapon, questionnaires to test personnel, individual interview, consultation with the contractor, conference and committee action, and the application of training experience with military judgment.

81mm Mortar. The 81mm mortar has been in existence since before World War II. An earlier version of the present system was extensively used in World War II and the present system was introduced in the early 1950's. The present system is the result of an evolutionary process of product improvements in the components of the system.

Each new or improved component has resulted in an operational improvement and has necessitated a change in the training program. It is not known what procedures were originally used to develop the training program for mortars because of their long standing use by Armed Forces around the world.

It is, however, the consensus of opinion among personnel currently serving at the U.S. Army Infantry School (USAIS) that a similar procedure to that being used today for training program development for new weapons was used to develop the training program for the 81mm mortar. A task analysis for operational use of the system has been recently drafted by the USAIS; however, it is concerned with the analysis of operational tasks rather than human functions associated with weapon manipulation.

Heavy Antitank/Assault Weapon System - (TOW). The current Heavy Antitank Weapon (HAW) is the TOW Weapon System. This weapon was developed by the Hughes Tool Company in response to a Department of the Army approved QMR for a system to replace the 106mm Recoilless Rifle as the Infantry HAW. The physical and performance requirements stated in the QMR were met by the contractor and in some cases were exceeded.

The contractor developed a recommended training program utilizing the expertise of both mechanical and human engineers to optimize the delivery of the missile and the ease of operation and training of crew personnel. The TOW was closely monitored during development by personnel assigned to the Weapons Department of the USAIS. When the service test of the TOW was conducted at the U.S. Army Infantry Board (USAIB), personnel from the USAIS assisted in the development of the initial training program to train test soldiers, assisted by contractor personnel. The training program was used in the service test and jointly evaluated by the USAIS and USAIB. As a result, an initial

33 hour training program was structured which has proven, with minor modification, to be an effective training program in subsequent years with the adoption and fielding of the system.

Currently, regulations governing the role of the Service School in the testing of new equipment require that the personnel responsible for development of the training program and associated training devices begin their evaluations early in the material development and during operational testing phases to permit the completion of training programs, development of necessary training devices and related training aids in a timely manner to coincide with fielding of the system by the Army. In this manner, the expertise of a number of governmental agencies is utilized in development of the training program, literature and devices. Numerous techniques are generally utilized, including observation, trial and error, conference, questionnaire, and field experiment and test.

UTILIZATION OF MISSION PROFILES

81mm Mortars. Mortars have been in use for a number of years and the mission profile has changed little except to keep pace with the increases in effectiveness and performance provided by each product improved weapon system. It is not known what type of mission profile was initially used in the initial task analysis; however, the current mission profile being used for the development of new mortars has evolved from earlier profiles, and it can be assumed that much of the present profile was contained in early profiles.

The current mission profile which is primarily tactical in nature and does not specify individual performance requirements is summarized as follows:

1. The mission of mortars is to provide close and continuous indirect fire support for maneuver units of the parent unit. Mortars will be used by Infantry battalions and companies.
2. In the offense, mortars will provide preparatory fires on known enemy positions and on objectives assigned to the elements of the parent organization. On call, fires will be employed to support units in the attack against enemy personnel, vehicles, and positions opposing organic forces. The mortars are positioned well forward to support attacking units.
3. In the defense, mortars will be positioned to the rear of forward elements to fire upon attacking enemy personnel and deny enemy access to routes of approach into the friendly positions. Mortar fire will be used to support the counterattack, to delay and as appropriate to provide screening smoke.
4. Mortars are primarily used to create personnel casualties but have the capability of providing illumination at night, screening smoke, and the delivery of chemical munitions when required.
5. Mortars deliver supporting fires, in support of maneuver units as follows:
 - a. Known enemy locations.
 - b. Suspected enemy locations.
 - c. Terrain features which provide the enemy with an operational advantage such as, observation posts, assembly areas, avenues of approach, and weapon positions.
6. Typical offensive fires include:
 - a. Assistance in the advance of supported units.
 - b. Assist in gaining fire superiority.
 - c. Assist in breaking enemy counterattacks.

- d. Disrupt communications systems.
- e. Disrupt resupply and reinforcement.
- 7. Typical fires to support the defense:
 - a. Fires to disorganize before the enemy attacks.
 - b. Close defensive fires.
 - c. Final protective fires.
 - d. Fires in support of the counterattack.
- 8. Tactical missions must be executed by mortars during all periods of visibility, in different geographical areas and climates where Infantry may be expected to fight.

Heavy Antitank Weapon (HAW). The HAW mission is to provide a heavy antitank/assault capability for use by all types of Infantry; Infantry, Airborne Infantry, Airmobile Infantry and Mechanized Infantry. The system will be employed from vehicles and ground mounts to attack enemy armored vehicles at the longer ranges. It will also be employed against enemy fortifications and materiel targets when appropriate. A high probability of first round hit to its maximum range is required against both stationary and moving targets. Its primary role is antitank. The HAW will be used in the attack and defense during both daylight and at night.

AMOUNT OF TRAINING REQUIRED FOR PROFICIENCY

The number of practice rounds and the use of training devices as described in the following paragraphs were identified as necessary for achieving an acceptable level of firing proficiency.

81mm Mortar. Discussions with personnel at the U.S. Army Infantry School revealed that the number of rounds required for weapon proficiency was probably developed in conjunction with the service test; however, the service test occurred several years ago and the exact procedure is not known. It is believed that the experience with mortars goes back several years and one training program became the basis for the current system.

The number of rounds currently being used to establish initial proficiency in AIT is shown in Table B-4. This does not imply that upon completion of AIT each mortarman is proficient as a gunner. He is only qualified to continue training at the unit level as will be described later.

TOW. Discussions with personnel at the U.S. Army Infantry School and U.S. Army Infantry Board revealed that the service test was the basis for developing the criteria for proficiency. Additional training tests were conducted by the U.S. Army Infantry School subsequent to the service test to refine knowledge and procedures developed in the training sub-test of the service test. Few changes have been necessary in the training program or the qualification criteria.

TRAINING METHODS

TRAINING SEQUENCE

81mm Mortar. The complete training sequence for the 81mm mortar extends from AIT through advanced course training several months or years after the completion of initial training. When selected for mortar training, a soldier completes the AIT training in MOS 11C and is awarded the skill digit of 10. He is qualified to perform as a member of a mortar crew; however, additional on-the-job training (OJT) in a unit is required before he is fully qualified to become a mortar gunner, a fire direction computer, or a primary forward observer (FO). After OJT, the soldier is awarded the skill level of 20 and may be elevated to gunner or begin receiving training as a computer or FO. Those mortarmen who show the greatest promise are advanced in grade and sent to the NCO Basic Course at the U.S. Army Infantry School where they receive detailed training in fire direction computation and FO procedures. Upon return to their unit, they are qualified to become a mortar squad leader, fire direction computer

or FO. Those personnel who remain in the Army and attain the position of mortar platoon sergeant may be sent to the Infantry Mortar Platoon Leader's course at the USAIS. Completion of this intensive course of instruction completes the mortarman's formal training.

TOW. The training sequence for the TOW includes initial weapon training in AIT, subsequent OJT in the unit, and additional training in the NCO Basic Course at the USAIS.

PRACTICAL EXERCISES

81mm Mortar. The mortar training program in AIT consists of 120 hours of instruction. Of this, 30 hours are devoted to training on the 4.2" mortar and 80 hours on the 81mm mortar. Practical exercises for the 81mm mortar are conducted by period as follows: (Instructor/Trainee ratio is 1: each crew of 4).

PERIOD 2 (1 hour) - Introduction to the M53 Sight Unit. This is a one-hour period consisting of 15 minutes of explanation and demonstration and 35 minutes of practical work by trainees. Trainees index the sight for elevation and deflection. Each trainee performs this function 6-10 times, depending upon the size of the group.

PERIOD 3 (4 hours) - Mounting and dismounting the 81mm mortar. This is a 4-hour period containing 20 minutes of explanation and demonstration of mounting the mortar, and 80 minutes of practical work by trainees in mounting. Each trainee mounts the mortar two times. After mounting, trainees are given an explanation and demonstration on placing out aiming stakes for 15 minutes, and this is followed by 80 minutes of practical work in placing out stakes. The remaining five minutes is a summary and critique.

PERIOD 4 (2 hours) - Fire commands and manipulation for small deflection and elevation changes. Trainees are taught to respond to fire commands and make small sight changes, not requiring the movement of

the bipod. Twenty-three minutes are consumed for explanation, demonstration and summary. Seventy-five minutes are used for practical work requiring trainees to respond to fire commands and placing small settings on the sight. Each trainee performs these functions several times depending upon the size of the group.

PERIOD 5 (4 hours) - Fire command and manipulation for large deflection and elevation changes. Twenty minutes are required for explanation and demonstration, and 180 minutes are devoted to practical work. Each trainee performs the required functions approximately 12 times.

PERIOD 6 (3 hours) - Fire commands, referring the sight, and realigning the aiming posts for the 81mm mortar. Twenty minutes are spent in explanation, demonstration and summary. Practical exercises are conducted for 130 minutes. Trainees practice responding to fire commands by referring the sight to an announced deflection and elevation, and realigning the aiming posts. Each trainee performs these functions approximately 6-8 times.

PERIOD 8 (3 hours) - Reciprocal lay of the 81mm mortar. Twenty-three minutes are spent in explanation, demonstration and summary. Trainees are engaged in practical work for 127 minutes. Each trainee must manipulate the sight and mortar in response to fire commands during reciprocal lay procedures. Each trainee performs these functions 8-10 times.

PERIOD 9 (3 hours) - Fire commands and traversing fire. Explanation, demonstration and summary consume 20 minutes and the remaining 130 minutes are used for practical exercises. Trainees respond to fire commands and manipulate the 81mm mortar for traversing fire. Each trainee performs these functions 8-10 times.

PERIOD 10 (2 hours) - Misfire procedures for the 81mm mortar. Introduction, explanation, demonstration and summary consume 20 minutes and the remaining 80 minutes are practical exercises. Trainees must recognize at least 4 of the 7 causes for misfires and must be able to effectively apply misfire procedures for the 81mm mortar. During the practical exercise period, trainees perform the described functions several times.

PERIOD 11 (3 hours) - Crew Drill for the 81mm mortar. The introduction requires five minutes, and the rest of the period is practical exercise as follows:

- a. Mounting and dismounting - 100 minutes
- b. Small deflection and elevation changes - 60 minutes
- c. Referring the sight and realigning aiming posts - 63 minutes
- d. Large deflection and elevation changes - 75 minutes
- e. Manipulating for reciprocal lay - 65 minutes
- f. Manipulating for traversing fire - 35 minutes

Each trainee performs in all four positions of the mortar crew. Each trainee functions in each position several times.

PERIOD 12 (3 hours) - Practice Gunner's Examination. Trainees practice the gunner's examination, rotating through the six stations as follows:

- a. Mounting - 75 minutes
- b. Small deflection and elevation changes - 25 minutes
- c. Referring the sight and realigning stakes - 90 minutes
- d. Large deflection and elevation changes - 75 minutes
- e. Reciprocal lay - 25 minutes
- f. Traversing fire - 70 minutes

Performance standards are evaluated at each station by instructor personnel. Remedial training is given where necessary.

PERIOD 13 (2 hours) - Sight Calibration with M45 boresight and introduction to M34 sight unit. Introduction, explanation, demonstration and summary consume 18 minutes. Practical exercise is conducted for 72 minutes. Trainees index deflection and elevation on the M34 sight for 12 minutes and operate the M45 boresight for 60 minutes. Each trainee indexes the M34 sight one time and boresights two times.

PERIOD 14 (4 hours) - Introduction to basic forward observer (FO) procedures. Seventy minutes are used for introduction, explanation, demonstration and summary. Trainees participate in practical exercises on

the four methods of target location for 60 minutes and formulate calls for fire using the four methods for a period of 70 minutes.

PERIOD 15 (4 hours) - Basic FO procedures. Practical exercise is conducted as follows:

- a. Spotting for range and deviation - 10 minutes
- b. Measuring mil angles - 10 minutes
- c. Convert mil angles to lateral shift - 20 minutes
- d. Adjusting fire using bracketing method - 50 minutes
- e. Adjusting fire using creeping method - 50 minutes

The remaining time is consumed in explanation and demonstration.

PERIOD 16 (8 hours) - Basic fire direction center procedures. The following practical exercises are conducted:

- a. Determining initial data with map and protractor - 20 minutes
- b. Use of abridged firing tables - 12 minutes
- c. Formulation of initial and subsequent fire commands - 25 minutes
- d. Operation of the M16 plotting board - 50 minutes
- e. Sheaf parallel using the mil relation formula - 30 minutes
- f. Computation of fire missions from calls for fire using the grid coordinate, reference point, and marking round methods of target location - 148 minutes

The remaining time is consumed in explanation and demonstration of the above listed functions.

PERIOD 17 (4 hours) - Techniques of fire without and FDC. The following practical exercises are conducted:

- a. Direct lay and burst on target adjustment - 62 minutes
- b. Direct alignment and ladder adjustment - 85 minutes.

The remainder of the period is used to explain and demonstrate the above listed functions.

PERIOD 18 (30 hours) - 81mm live fire exercise, day and night. The trainee is required to perform the duties of the mortar gunner, assistant gunner, ammunition bearer, FO in calling for fire, and as a computer in the FDC using the M16 plotting board, under both daylight and night

conditions. Practical exercises are conducted as follows using live ammunition:

- a. Unpacking 81mm mortar ammunition - 11 minutes
- b. Setting times on illumination fuzes - 16 minutes
- c. Repacking mortar ammunition - 5 minutes
- d. Using M45 Boresight - 11 minutes
- e. Removal of misfire - 16 minutes
- f. Performing safety checks - 10 minutes
- g. Crew operation - 40 minutes
- h. Reciprocal lay at night - 40 minutes
- i. Adjustment of fire (all methods) - 300 minutes
- j. Adjustment of illumination rounds - 80 minutes
- k. FDC computation (day and night) - 300 minutes

PERIOD 23 (8 hours) - Reinforcement and review for gunner's examination.

Practical exercise to prepare for the gunner's examination is as follows:

- a. Mounting the mortar - 100 minutes
- b. Small deflection and elevation changes - 70 minutes
- c. Referring the sight, realigning posts - 70 minutes
- d. Large deflection and elevation changes - 76 minutes
- e. Reciprocal lay - 76 minutes

PERIOD 24 (8 hours) - Gunner's examination and proficiency test. The gunner's examination is administered as outlined in FM 23-90 - 290 minutes. A proficiency test on FO procedures, FDC procedures, and mechanical training is administered requiring 100 minutes.

Tables B-1 and B-2 reflect a summary of mortar instruction presented in the NCO Basic Course and Infantry Mortar Platoon Leader's Course. These courses provide advanced training in all of the elements of mortar gunnery to include mechanical training, fire direction center procedures, and forward observer procedures. The bulk of the instruction is oriented toward the 4.2" mortar; however, the 81mm mortar application is integrated throughout. A summary of 81mm ammunition expended during these courses is reflected in Tables B-3 and B-4.

TOW. The TOW training in AIT consists of 33 hours of instruction. No live missiles are fired during this training. The trainee achieving the highest score during the TOW training is permitted to fire a live missile in demonstration at the end of the course of instruction. Men selected for TOW training in MOS-11H are selected from those who complete the regular 11H AIT in recoilless weapons. They are usually the most proficient and capable men in the group who have full tours of duty remaining in the Army. At present, only those personnel who will be assigned to Europe or to one of the Airborne Divisions are given TOW training at the Infantry Training Center, Fort Polk, Louisiana. Trainee/instructor ratio at present is 4:1 (1 instructor/each crew of 4 men). Practical exercises are conducted by period as follows:

PERIOD 3 (2 hours) - Functioning of the M70 training set. Trainees must know purpose, characteristics, capabilities, components and functions of the training set. The first hour is devoted to explanation and demonstration of the training set. The second hour trainees practice laying on targets utilizing the training sets. Each trainee completes 2-3 trials.

PERIOD 4 (1 hour) - Maintenance procedures for the TOW. Trainees are taught proper operator maintenance checks and procedures by conference and demonstration for the first 25 minutes. During the last 25 minutes, trainees perform maintenance procedures, identify maintenance problems, and perform checks under supervision of an instructor. As each trainee performs, the other members of the crew observe. One trial per trainee is conducted.

PERIOD 5 (5 hours) - Vehicle modes. The first two hours are spent in explanation and demonstration of crew functions on the vehicles which mount the TOW system. The last three hours are spent in practical exercise. Trainees are divided into four-man crews and each man rotates through the duties of Squad Leader, Gunner, Assistant Gunner and Armament

Bearer on a weapon mounted truck 1/4 Ton M151A1, Armored Personnel Carrier M113, and the M274 weapons carrier. Each man performs in each position on each vehicle one time.

PERIOD 6 (6 hours) - Crew Drill. In this period, the trainees perform self test and operate the APC mounted, 1/4 ton truck mounted and 1/2 ton mounted TOW system, and the ground mounted version. The first 30 minutes is used as conference and demonstration. The remaining 5.5 hours are practical exercise in crew drill on each of the vehicles and the ground mount.

PERIOD 7 (10 hours) - Instructional firing, Tables I, II, III, IV and V. Trainees must install and operate the M70 training set, engage both stationary and moving targets, load and fire the missile simulation round to engage multiple targets. Trainees are divided into crews of four and firing is conducted from all vehicle modes. The first 30 minutes is range orientation, the remaining 9.5 hours is range firing, using the appropriate score cards.

PERIOD 8 (1 hour) - Familiarization firing, Table VI, night firing techniques. Trainees receive 15 minutes range orientation and spend the remaining 35 minutes in practical exercise engaging targets as prescribed by Table VI in the field manual.

PERIOD 9 (2 hours) - Performance examination. Trainees are examined on their knowledge and skill at four stations. Each station requires 19 minutes. Trainees must attain a score of 70% at each station on each test.

PERIOD 10 (3 hours) - Qualification firing, Table VII. Trainees must qualify as TOW gunners, using the M70 training set and missile simulation round.

Army Subject Schedule 7-11HP4, MOS Technical Training of Infantry Direct Fire Crewman contains a detailed explanation of each period of instruction and each Table to be fired.

A summary of the advance training provided by the USAIS to those personnel in MOS 11H selected to attend the NCO Basic Course is shown in Table B-5.

PROFICIENCY MEASUREMENT

81mm MORTAR

During Period 24 of the AIT, trainees are given the gunner's examination and a proficiency test. This period is eight hours. Six hours are used to administer the gunner's examination and two hours for the proficiency test. The score attained on the gunner's examination is the basis for establishing weapons proficiency and award of the MOS 11C10.

Gunner's Examination. Six separate stations are used in the conduct of the examination. A detailed explanation of the gunner's examination may be found in Chapter 4, FM 23-90. Examination subjects are as follows:

	<u>Points</u>
1. Mounting the mortar	40
2. Small deflection and elevation change	30
3. Referring the sight and realigning aiming posts	30
4. Large deflection and elevation change	40
5. Reciprocal laying	30
6. Manipulation for traversing fire	<u>30</u>
Total possible credits	200

Qualification Score:

	<u>Score</u>	<u>Percent</u>
Expert Gunner	180	90
1st Class Gunner	160	80
2nd Class Gunner	140	70
Unqualified: Less than	140	70

Proficiency Test. A three station setup is used to administer this test. Each station requires the trainee to physically perform some action he learned during his MOS-oriented AIT. The stations are as follows:

	<u>Time/Minutes</u>
1. Mechanical Station	12
2. FDC Station	12
3. FO Station	12

The proficiency test does not officially influence award of the MOS nor does it assist in establishing the level of weapons proficiency. It appears that the performance measure is valid.

TOW

Successful completion of AIT in MOS 7-11H10 is a prerequisite to training. Soldiers who successfully complete the additional week of TOW training are awarded MOS 11HP410. Discussion with the TOW training group at Fort Polk, Louisiana, revealed that to date only small groups have been trained on TOW, and no trainee has failed to satisfactorily complete the course of instruction because of the screening and selection procedures. Each trainee receives close and continuous observation and supervision throughout the 33 hours of instruction. At the conclusion of each period of instruction, instructor personnel identify any trainee who may have had difficulty and additional instruction is given on an individual basis to bring him up to the standards desired. A performance and written examination is given during Period 9 of the instruction, and score cards are maintained during the firing of Tables I, II, III, IV and V in Period 7 and Table VI in Period 8. The written and performance examination is administered using five stations and trainees must achieve 70% at each station. Stations are worth 20 points each for a total of 100 points and are as follows:

1. Station 1 - Identification of basic components of TOW
2. Station 2 - Perform TOW system self test
3. Station 3 - Correctly connect instructor console to TOW
4. Station 4 - Prepare a missile for loading
5. Station 5 - Answer a 10 question test.

Trainees who fail a station receive remedial training and are retested until a satisfactory score is obtained. Table B-3 is the qualification table and each trainee must successfully qualify in each task of Table B-3 in order to qualify as Expert, 1st or 2nd Class Gunner. The M70 training device is used and qualification scores are as follows:

- | | |
|---------------------|------------------|
| 1. Expert | 1198-1398 points |
| 2. 1st Class Gunner | 1061-1197 points |
| 3. 2nd Class Gunner | 922-1060 points |
| 4. Unqualified | Below 922 points |

Detailed point explanation may be found in Figures 8-17 (Scoring Table), Page 133 of TC 23-23, TOW Heavy Antitank Weapon System. Judging from the subsequent performance of TOW gunners in units after completion of AIT, it appears that the performance measures provide a valid indication of the level of proficiency required.

UNIT TRAINING

At the present time no specific training program exists in unit training for either the TOW or the 81mm mortar. Prior to 1971, specific Army Training Programs (ATP) and accompanying Army Subject Schedules were in effect to guide unit training in a Basic Unit Training and Advanced Unit Training. In 1971 the Army Chief of Staff decentralized training and placed the responsibility for training and proficiency upon the unit commander at all levels of command. Since that time it has been the prerogative of the individual commander as to the type and length of training his unit would undergo to prepare for the many assigned missions. In the TOE units, an annual Operational Readiness Training

Test (ORTT) is conducted to obtain an annual evaluation of the state of readiness of units. The commander evaluates the needs of his unit and structures whatever he feels is most needed in training to prepare for the ORTT. Old Army Training Tests (ATT), Subject Schedules, and training programs are still being used by many units as a guide to prepare for and conduct the ORTT. All of the training devices are available for unit use in the TOW and 81mm mortar training, and all are used to varying degrees from unit to unit. There appear to be strong efforts underway to delete the requirement for annual qualification, and rely only on the annual ORTT for maintenance and proficiency.

TABLE B-1
INSTRUCTIONAL SUMMARY
USAI5 BASIC NCO COURSE

81UM MORTAR

PERIOD	SUBJECT	INSTRUCTIONAL METHOD (HOURS)					TOTAL HOURS	REMARKS
		L	C	D	PE	E		
WOEB01	INTRODUCTION TO MORTARS		.3	.7			1	
WOEB02	MECH. TRAINING						5	Includes 4.2" mortar
WOEB03	SECTION TNG. M-2 AIMING CIRCLE	1	1	.8	5.2		8	
WOEB04	SECTION TNG. M-2 COMPASS	.2	.2	.2	1.4		2	
WOEB05	CONDUCT OF FIRE	1	1		3		5	Includes 4.2" mortar
WOEB06	DUTIES OF FO	.5	.5				1	
WOEB07	INTO. TO FO PROCEDURES	1.5	1	.5			3	
WOEB09	VERTICAL & HORIZONTAL ANGLES	1	.4		1.6		3	
WOEB10	PREP. TERRAIN SKETCH	.4	.1		.5		1	
WOEB11	REG. & SHEAF ADJ.	2	1	.5	.5		4	
WOEB12	AMMUNITION FOR MORTARS	.3	.4	.3	1		2	
WOEB13	PRAC. APPLICATION ADJ. FIRES		1		3		4	
WOEB14	AIR & SCREENING MISSIONS	1	2		1		4	
WOEB15	ILLUM. NIGHT OBS. DEVICE	1	.5		.5		2	
WOEB16	BALLISTICS	.2	.6		.2		1	
WOEB17	NIGHT FIRE, FUZE ILLUM. ROUND	.2	.1		.7		1	Includes 4.2" mortar
WOEB18	ADJ. ILLUM. ROUNDS		.5	.5	1		2	
WOEB19	ADJ. SCREENING & AIR MISSIONS				4		4	
WOEB21	INTRODUCTION FDC	.8	.1	.2	2		4	
WOEB22	FIRE CONTROL, M-16 PLOTTING BOARD	1	1		4		6	

L-Lecture
C-Conference
D-Demonstration
PE-Practical Exercise
E-Evaluation

TABLE B-1

(cont'd)

PERIOD	SUBJECT	L	INSTRUCTIONAL METHOD (HOURS)				TOTAL HOURS	REMARKS
			C	D	PE	E		
WOEB23	TEAM DRILL, FIRE CONTROL, M-16 P.B.				4		4	
WOEB25	REGISTRATION & CORRECTIONS	2	3		3		8	
WOEB26	RE-REGISTRATION	.5	.5		1		2	
WOEB27	TEAM DRILL II, REG. & SHIFT		.4	3.6*			4	
WOEB29	TRANSFER TO SURVEY CHART	1	1		2		4	
WOEB30	TEAM DRILL III				2		2	
WOEB36	INTERSECTION, POLAR, RADAR REG.	.3	.3		2.4		3	
WOEB37	SCREENING, AIR & ILLUM.	2	2		4		8	
WOEB41	ADVANCED FDC PROC.	1	1		6		8	
WOEB42	TEAM DRILL VI CONTROL 81MM MORTAR				4		4	
WOEB45	SELECTION OF MORTAR POSITIONS		.2		1.8		2	
WOEB47	FIRE W/O FDC		1		3		4	
WOEB48	TRAINING TECHS. & DEVICES		1		2		3	
WOEB08	MECHANICAL TRG. EXAM.					2	2	Practical & written
WOEB20	FO EXAMINATION					4	4	"
WOEB28	FDC EXAMINATION I					4	4	"
WOEB35	FDC EXAMINATION II					4	4	"
WOEB49	FDC EXAMINATION III					4	4	"
WOEB43	FDC EXAMINATION IV					2	2	"

L-Lecture
 C-Conference
 D-Demonstration
 PE-Practical Exercise
 E-Evaluation

TABLE D-2

INSTRUCTIONAL SUMMARY
INFANTRY MORTAR PLATOON LEADER COURSE
81MM MORTAR

PERIOD	SUBJECT	INSTRUCTIONAL METHOD (HOURS)					TOTAL HOURS	REMARKS
		L	C	D	PE	E		
WM1D01	INTRODUCTION, DUTIES OF PERSONNEL	.5	.5				1	Course Review
WM1D02	OCCUPYING/ORGANIZING FIRING POSITION	.5	.5		1		2	Includes instruction on 4.2" mortar
WM1D03	MECHANICAL TRAINING	1	1		3		5	Includes 4.2" mortar
WM1D04	SIGHTS, M-2 AIMING CIRCLE, M-45 BORESIGHT		1.5	.5	2		4	Includes 4.2" mortar
WM1D05	DECLINATION, MAINT. M-2 AIMING CIRCLE	.1	.1	.2	1.6		2	
WM1D06	LAYING, USING AIMING CIRCLE, COMPASS		1.4	.5	2.1		4	
WM1D07	SQUAD DRILL		.5		1.5		2	Includes 4.2" mortar
WM1D08	CONDUCT OF FIRE	1	1	1	3		5	Includes 4.2" mortar
WM1D09	NIGHT CONDUCT OF FIRE		.6		1.4		2	
WM1D10	PREP. STORAGE, DESTRUCTION ALBU.		1		2		3	
WM1D49	MAINT. PLAT. EQUIPMENT				3		3	
WM1D53	TRAINING TECH. DEVICES	.4	.2	.4	3		4	
WM1D54	TRAINING MANAGEMENT	.7	.3				1	
WM1D11	EXAMINATION					2	2	
WM1D24	INTRO. TO FDC		4				4	Includes 4.2" mortar
WM1D33	FIRE CONTROL, M16 PLOTTING BOARD		.5	.5	5		6	
WM1D48	FTX				24		24	
WM1D12	DUTIES OF FO, OCCUPY POSITION	.2	.4		.4		1	
WM1D14	INTRO. FO PROCEDURES	.5	1		1.5		3	

L-Lecture
C-Conference
D-Demonstration
PE-Practical Exercise
E-Evaluation

TABLE B-2
(cont'd)

PERIOD	SUBJECT	INSTRUCTIONAL METHOD (HOURS)					TOTAL HOURS	REMARKS
		L	C	D	PE	E		
WM15	FO PROCEDURES		.5	.2	2.3		3	
WM13	PREP. TERRAIN SKETCH		.8		.1	.1	1	
WM17	REG, ADJ, FINAL PROT. FIRES		1	1	2		4	
WM18	FO SERVICE PRACTICE				4		4	
WM19	SCREENING, AIR OBSERVATION		2		2		4	
WM21	FO SERVICE PRACTICE II		.4	.2	3.4		4	
WM20	ILLUM. NIGHT OBS. DEVICE		3				3	
WM22	FO SERVICE PRACTICE III		.3	.7	2		3	
WM25	EXAMINATION					1	1	Written Exam
WM47	FIRE PLNG. CRATER ANALYSIS	1.5	1.5		2		5	
WM52	FIRE W/O FDC, CARRIER		1		3		4	
WM42	FO/FDC FIRING EXERCISE				8		8	
WM50	EXAMINATION					1	1	
TOTALS		5.4	25	5.2	83.3	5	123	

L-Lecture
C-Conference
D-Demonstration
PE-Practical Exercise
E-Evaluation

TABLE B-2
INSTRUCTIONAL SUMMARY
USAIS BASIC NCO COURSE

TOW

PERIOD	SUBJECT	INSTRUCTIONAL METHOD					TOTAL HOURS	REMARKS
		L	C	D	PE	E		
WEEB44	INTRODUCTION TO TOW							
WEEB45	TOW INSTR. FIRING & VEH. MODES		6.5	.5	1		8	
WEEB48	NIGHT FAM. FIRING		.3		7		7	
WEEB46	INSTR. FIRING & CREW DRILL				.7		1	
WEEB47	INSTR. FIRING, CREWDRILL, EXAM				8		8	
WEEB49	QUALIFICATION FIRING				4	2	6	
					3		3	
TOTALS			6.8	.5	23.7	2	33	

L-Lecture
C-Conference
D-Demonstration
PE-Practical Exercise
E-Evaluation

TABLE B--

AIT ATTENTION

81MM MORTAR

CARTRIDGE	PERIOD	PER TRAINEE	CO/DISCREMINATION
81MM, HE, M374A1, INERT	7		1
81MM, WP, M375A1, INERT	7		1
	18		3
81MM, ILLUM, M301A3, INERT	7		1
81MM, HE, M362, INERT	7		1
81MM, WP, M370, INERT	7		1
81MM, ILLUM, M301A2, INERT	7		1
	18		3
	24		1
81MM DUMMY	10	1/2	2
81MM, HE, M374A1, W/PDF	10	1/3	2
	17	3	
	18	8	9
81MM, ILLUM, M301A3 W/M34A1 FUZE	18	2 1/2	

TABLE B-5
AMMUNITION SUMMARY
NCO BASIC COURSE
81MM MORTAR

PERIOD	CARTRIDGE	FIRE BY STUDENTS	*FIRE FOR DEMONSTRATION
WOEB 46	81MM, HE, M374A1	370	0
	81MM, ILLUMINATION, M301A3	122	0
WOEB 47	81MM, HE, M374A1	150	0

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TABLE B-6
AMMUNITION SUMMARY
INFANTRY MORTAR PLATOON COURSE
81MM MORTAR

PERIOD	CARTRIDGE	FIRE BY STUDENTS	*FIRE FOR DEMONSTRATION
WOID 48	81MM, HE M374A1	148	0
	81MM, ILLUMINATION, M301A3	62	0
WOID 49	81MM, HE, M374A1	84	0

344

* Demonstration firing done using 4.2" mortars.

TABLE B-7

AMMUNITION ALLOCATION

UNIT TRAINING

WEAPON	A I T		B U T			A U T					
	PER	TRAINEE PER COMPANY	QUAL	SQD.	PLAT.	CO.	QUAL	SQD.	PLAT.	CO.	
81MM MORTAR	12.3	18	0	103	96	0	33	73	185	31	11
*TOW	0	0	0	0	0	0	0	0	0	0	0

* During annual training and tests, the TOW utilizes the M70 trainer and Blast Diaphragms. Annual service practice allocates 2 missiles per crew, however, these are not fired in conjunction with the parent unit training.

APPENDIX C

ARMOR, BRIEF SURVEY

M60A1 TANK

Instructional Method	Hours of Instruction For Each Level of Training		
	AIT	OBC	UT
Lecture			
Conference	13	6.5	17
Demonstration	1	4.0	4
Practical Exercise	46	49.5	80
Peer Instruction			
Instructor Guidance and Critique With Small Group			60
Individualized (self paced)			
Group Paced			
Self Study			
Guest Speaker			
Case Study			
Seminar			
Computer Assisted Instruction			
Programmed Instruction			
Other:			
Examination		3.0	
Total Hours of Instruction	60	63	161

ARMOR
M60A1 TANK

Instructional Media	Percentage of Course Objectives Achieved With Various Media		
	AIT	OBC	UT
Field Trips			
Training Device	(10%)*	16%	(50%)*
Audio Tape Rcrds			
Transparencies	5%	2%	2%
Filmstrips			
Still Pictures			
Printed Material	10%	3%	5%
Television		2%	
Motion Pictures	22 min. film on M73	.5%	5%
Actual Eqp.	85%*	63.5%	65%*
Instructor	(85%)**	8%	24%
Other <u>Examination</u>		5.0%	

*Training devices mounted on actual equipment.

**Instructor supervision during most training.

ARMOR

M60A1 TANK

Practical Exercises	Amount of Practice		
	AIT	OBC	UT
CREW DRILL			
Live Fire			99 rds per crew
Simulated Fire			
Dry Fire			
INDIVIDUAL DRILL			
Live Fire	Main Gun-14 rds M73 - 325 rds M85 - 50 rds	Platoon Leader 17 rds, 105mm	
Simulated Fire	34 (trials)	Lazer or sub-caliber, 104 trials	
Dry Fire	1 hour		

Armor

M60A1 TANK

End of Course Proficiency Measurement	Percent of Total Evaluation		
	AIT	OBC	UT
Type of Measure			
Norm Referenced (curve)			
Criterion Referenced (go/no go)	100%	100%	100%
Type of Evaluation			
Paper and pencil		20%	
Hands-On, Part Task	100%	70%	40%
Performance With Training Devices		10%	20%
Crew Drill, Gunner's Test			20%
Integrated Test of Terminal Per- formance require- ment			20%

Armor

M60A1 TANK

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee		
	AIT	OBC	UT
Evaluation of Firing Proficiency			
Crew Performance			
Live Fire		Plat Ldr 6-105mm 200-7.62mm	52 rds-105mm 890 rds-50 Cal
Simulated Fire		90-Cal 50	2491 rds-7.62mm
Dry Fire			
Individual Perform- ance			
Live Fire	14(main gun)		
Simulated Fire	17(trials) M73 Laser	Plat Ldr 296 trials with laser	
Dry Fire			

Armor
M60A1 TANK

Training Management Considerations	AIT	OBC	LT
Prescribed Inst/ Stu. Ratio	1:3	1:3	1:3
Time Period Over Which Instruction Is Scheduled	7 weeks	9 weeks	Annually
*Total Hours Allocated For Course	60 hours	63 hours	161 hours
Hours For Training	45 hours	60 hours	61 hours
Hours For Evaluation	15 hours	3 hours	100 hours

* Gunnery training only.

Armor

M60A1 TANK

Facilities and Fiscal Support For Training	AIT	OBC	UT
Weapon Cost			
Initial (gun tube only)	\$4,285	\$4,285	\$4,285
Weapon or Barrel Life in Terms of Rounds	900 rds	900 rds	900 rds
Maintenance (weapon/prime mover) Per Day	12 man hours	8 man hours	8 man hours
Ammunition (cost per round)	TPT-\$47.02 HEP-\$55.10	TPT-\$47.02 HEP-\$55.10	TPT-\$47.02 HEP-\$55.10 HEAT-\$69.42 WP-\$56.90 APERS-\$333.30
Approximate Sizes of Ranges Required For Training			
Tactical Exercises (maneuvers)	Tank Co-100sq. km.	Tank Co-100 sq.km. Tank Bn-300sq. km.	Tank Co-100 sq. km. Tank Bn-300 sq. km.
Live Firing			
Company - Tank	13x17.5 miles	13x17.5 miles	13x17.5 miles
Battalion			
Number of Support Personnel Required For Live Firing			
Direct Support (Asst Instructors)	11	3 OFF/16 EM	4 OFF/17 EM
Indirect Support (Range Sup., Med.)	13	1 OFF/39 EM	1 OFF/20 EM

ARMOR
M60A2 TANK

Instructional Method	Hours of Instruction For Each Level of Training		
	AIT	OBC	UT
Lecture			
Conference	4	2	14
Demonstration			4
Practical Exercise	64	8	98
Peer Instruction			
Instructor Guidance and Critique With Small Group			80
Individualized (self paced)			
Group Paced			
Self Study			
Guest Speaker			
Case Study			
Seminar			
Computer Assisted Instruction			
Programmed Instruction			
Other:			
Examination			
Total Hours of Instruction	68	10	192

ARMOR

M60A2 TANK

Instructional Media	Percentage of Course Objectives Achieved With Various Media		
	AIT	OBC	UT
Field Trips			
Training Device	60%		(50%)*
Audio Tape Rcrds			
Transparencies	5%	20%	2%
Filmstrips			
Still Pictures			
Printed Material	10%		5%
Television			
Motion Pictures			5%
Actual Eqp.	25%	80%	65%*
Instructor			18%
Other			

* Training devices mounted on actual equipment.

ARMOR

M60A2 TANK

Practical Exercises	Amount of Practice		
	AIT	OBC	UT
CREW DRILL			
Live Fire			142 rds
Simulated Fire			
Dry Fire			
INDIVIDUAL DRILL			
Live Fire	Main Gun-12 rds M73 - 150 rds		
Simulated Fire	4 hours	Plat Ldr-5 trials	
Dry Fire	5 hours		

Armor

M60A2 TANK

End of Course Proficiency Measurement	Percent of Total Evaluation		
	AIT	OBC	UT
Type of Measure			
Norm Referenced (curve)			
Criterion Referenced (go/no go)	100%	100%	100%
Type of Evaluation			
Paper and pencil			
Hands-On, Part Task	100%	50%	40%
Performance With Training Devices		50%	20%
Crew Drill, Gunner's Test			20%
Integrated Test of Terminal Per- formance require- ment			20%

ARMOR
M1A1 TANK

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee		
	AIT	OBC	UT
Evaluation of Firing Proficiency			
Crew Performance			2-152mm (M1s) 70-152mm
Live Fire			1,380-50 Cal.
Simulated Fire			2,566-7.62mm
Dry Fire			
Individual Perform- ance			
Live Fire	12 rds (main gun)		
Simulated Fire	17 trials (M73 laser)	Plat Ldr-5 trials	
Dry Fire			

ARMOR
M109A1 TANK

Training Management Considerations	AIT	OBC	UT
Prescribed Inst/ Stu. Ratio	1:3	1:2	1:3
Time Period Over Which Instruc- tion Is Scheduled	4 weeks	1.25 days	Annually
Total hours Allo- cated For Course	60 hours	10 hours	192 hours
Hours For Training	50 hours	10 hours	84 hours
Hours For Evalua- tion	10 hours	FAM only	108 hours

Armor
M60A2 TANK

Facilities and Fiscal Support For Training	AIT	OBC	UT
Weapon Cost			
Initial (gun/launcher tube only)	\$7,032	\$7,032	\$7,032 gun* tube only (1st change)
Weapon or Barrel Life in Terms of Rounds	800 rds	800 rds	800 rds
Maintenance (weapon/prime mover) Per Day	18 man hours	18 man hours	8 man hours
Ammunition (cost per round)	TPT-\$121.00 HEAT-\$196.00 APERS-\$412.00 Mls HEAT \$3582 Mls PRAC \$3162	TPT-\$121.00 HEAT-\$196.00 APERS-\$412.00 Mls HEAT \$3582 Mls PRAC \$3162	TPT-\$121.00 HEAT-\$196.99 APERS-\$412.00 Mls TPT \$3162 Mls HEAT\$3582
Approximate Sizes of Ranges Required For Training			
Tactical Exercises (maneuvers)	Tank Co-100sq. km.	Tank Co-100sq. km. Tank Bn-300sq. km.	Tank Co-100 sq.km. Tank Bn-300 sq.km.
Live Firing			
Company-Tank, 152mm CTG Battalion	13x17.5 miles	13x17.5 miles	13x17.5 miles
Number of Support Personnel Required For Live Firing			
Direct Support	Asst Instructor 11	Instructor Personnel 2 OFF/16 EM	
Indirect Support (Range Sup., Med.)	13	1 OFF/39 EM	

* 2nd Change Costs (10.708).

ARMOR

M551 AR/AAV

Instructional Method	Hours of Instruction For Each Level of Training		
	AIT	OBC	UT
Lecture			
Conference	7½	5	14
Demonstration	1½	1	4
Practical Exercise	31	13	98
Peer Instruction			
Instructor Guidance and Critique With Small Group			80
Individualized (self paced)			
Group Paced			
Self Study			
Guest Speaker			
Case Study			
Seminar			
Computer Assisted Instruction			
Programmed Instruction			
Other:			
Examination		2	
Total Hours of Instruction	40	21	192

ARMOR

M551 AR/AAV

Instructional Media	Percentage of Course Objectives Achieved With Various Media		
	AIT	OBC	UT
Field Trips			
Training Device	65%	48%	(50%)*
Audio Tape Rcrds			
Transparencies			7%
Filmstrips			
Still Pictures			
Printed Material	10%		5%
Television			
Motion Pictures		2%	5%
Actual Eqp.	25%	33%	65%*
Instructor	(100%)**		18%
Other 35mm Carousels		17%	

* Devices mounted on actual equipment.

** Instructor supervision during most training.

ARMOR

M551 AR/AAV

Practical Exercises	Amount of Practice		
	AIT	OBC	UT
CREW DRILL			
Live Fire			134 rds per crew
Simulated Fire			
Dry Fire			
INDIVIDUAL DRILL			
Live Fire	Main Gun-7 rds M73-225 rds M2-50 rds	*4 rds-152mm CTG	
Simulated Fire	28 trials	15 trials on COFT M41 & M42	
Dry Fire	15 trials		

*In addition, four missiles per class for demonstration.

Armor

M551 AR/AAV

End of Course Proficiency Measurement	Percent of Total Evaluation		
	AIT	OBC	UT
Type of Measure			
Norm Referenced (curve)			
Criterion Referenced (go/no go)	100%	100%	100%
Type of Evaluation			
Paper and pencil		10%	
Hands-On, Part Task	100%		40%
Performance With Training Devices		90%*	20%
Crew Drill, Gunner's Test			20%
Integrated Test of Terminal Per- formance require- ment			20%

* 70% here is conducted on the XM40 turret trainer.

Armor

M551 AR/AAV

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee		
	AIT	OBC	UT
Evaluation of Firing Proficiency			
Crew Performance			
Live Fire			2-152 Mls(rds)
Simulated Fire			70-152mm(rds)
Dry Fire			1,380-50Cal(rds)
Individual Perform- ance			1,566-7.62mm (rds)
Live Fire	7 rds Main Gun		
Simulated Fire	17(trials) M73 laser		
Dry Fire			

Armor

M551 AR/AAV

Training Management Considerations	AIT	OBC	UT
Prescribed Inst/ Stu. Ratio	1:3	1:3	1:3
Time Period Over Which Instruction Is Scheduled	3 weeks		Annually
Total Hours Allocated For Course	120 hours	21 hours	192 hours
Hours For Training	112 hours	19 hours	84 hours
Hours For Evaluation	8 hours	2 hours	108 hours

Armor

M551 AR/AAV

Facilities and Fiscal Support For Training	AIT	OBC	UT
Weapon Cost			
Initial (gun tube only)	\$7,929	\$7,929	\$7,929
Weapon or Barrel Life in Terms of Rounds	600 rds	600 rds	600 rds
Maintenance (weapon/prime mover) Per Day	18 man hours	18 man hours	8 man hours
Ammunition (cost per round)	TPT-\$121.00 HEAT-\$196.00 APERS-\$412.00 Mls, HEAT \$3,582 Mls, PRAC\$3,162	TPT-\$121.00 HEAT-\$196.00 APERS-\$412.00 Mls,HEAT \$3,582 Mls,PRAC \$3,162	TPT-\$121.00 HEAT-\$196.00 APERS-\$412.00 Mls(TPT) \$3,162 Mls(HEAT) \$3,582
Approximate Sizes of Areas Required for Training			
Tactical Exercise Area	Trp-450sq.km. Sqd-1350sq.km.	Trp-450sq.km. Sqd-1350sq.km.	Trp-450sq. km. Sqd-1350sq.km.
Live Firing - 152mm CTG Company Battalion	13x17.5 miles	13x17.5 miles	13x17.5 miles
Number of Support Personnel Required for Live Firing			
Direct Support (Instr.Personnel)	11	2 OFF/16EM	
Indirect Support (Range Sup.,Med.)	13	1 OFF/39EM	

ARMOR

M139 CANNON

Instructional Method	Hours of Instruction For Each Level of Training		
	AIT	OBC	UT
Lecture			
Conference	2	.4	
Demonstration	4	.6	
Practical Exercise	19	3.0	13
Peer Instruction			
Instructor Guidance and Critique With Small Group			
Individualized (self paced)			
Group Paced			
Self Study			
Guest Speaker			
Case Study			
Seminar			
Computer Assisted Instruction			
Programmed Instruction			
Other:			
Examination			
Total Hours of Instruction	25	4.0	13

ARMOR
M139 CANNON

Instructional Media	Percentage of Course Objectives Achieved With Various Media		
	AIT	OBC	UT
Field Trips			
Tracing Device			
Audio Tape Recds			
Transparencies			
Filmstrips			
Still Pictures			
Printed Material	10%		
Television			
Motion Pictures			
Actual Eqp.	90%	75%	100%
Instructor	(90%)*	25%	
Other			

*Instructor (present during "Hands-On Equipment").

ARMOR

M139 CANNON

Practical Exercises	Amount of Practice		
	AIT	OBC	UT
CREW DRILL			
Live Fire		100(fired by 1 student per crew)	325 per crew
Simulated Fire			
Dry Fire			
INDIVIDUAL DRILL			
Live Fire	20mm-50 rds M60MG-975 rds		
Simulated Fire			
Dry Fire	20mm-5 trials M60MG-10 trials		

Armor
M139 CANNON

End of Course Proficiency Measurement	Percent of Total Evaluation		
	AIT	OBC	JT
Type of Measure			
Norm Referenced (curve)			
Criterion Referenced (go/no go)	100%	100%*	100%
Type of Evaluation			
Paper and pencil			
Hands On, Part Task	100%	100%*	100%
Performance With Training Devices			
Crew Drill, Gunner's Test			
Integrated Test of Terminal Per- formance require- ment			

* Familiarization only.

Armor
M139 CANNON

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee		
	AIT	OBC	UT
Evaluation of Firing Proficiency			
Crew Performance			
Live Fire			130 rds, 20mm
Simulated Fire			
Dry Fire			
Individual Perform- ance			
Live Fire	Scout Observer, 786 rounds		
Simulated Fire			
Dry Fire			

Armor

M139 CANNON

Training Management Considerations	AIT	OBC	UT
Prescribed Inst/ Stu. Ratio	1:4	1:3	1:3
Time Period Over Which Instruction Is Scheduled	7 weeks	2 Days	Annually
Total Hours Allocated For Course	290 hours	4 hours	30 hours
Hours for Training	273 hours	4 hours	13 hours
Hours For Evaluation	17 hours		26 hours

Armor

M139 CANNON

Facilities and Fiscal Support For Training	AIT	ORC	DT
Weapon Cost			
Initial	\$5,590	\$5,590	\$5,590
Weapon or Barrel Life in Terms of Rounds	20mm-15,000 rds	15,000	15,000
Maintenance (weapon/prime mover) Per Day	8 man hours	8 man hours	8 man hours
Ammunition (cost per round)	20mm (APIT) \$5.83 20mm (TPT) \$2.12	20mm (APIT) \$5.83 20mm (TPT) \$2.12	20mm (APIT) \$5.83 20mm (TPT) \$2.12
Approximate Size of Ranges Required For Training			
Tactical Exercises (maneuvers)	Trp-450sq. km. Sqd-1350sq. km.	Trp-450sq. km. Sqd-1350sq. km.	Trp-450sq. km. Sqd-1350sq. km.
Live Firing M139	13x17.5 miles	13x17.5 miles	13x17.5 miles
Company			
Battalion			
Number of Support Personnel Required For Live Firing			
Direct Support	Target Acquisition, Comm-10	Asst. Inst. 12	Asst. Inst. 9 per platoon
Indirect Support (Range Sup., Med.)	6	7	6

Armor

Army Training Test - Unit Training

Proficiency Measurement	Percent of Total Evaluation			
	M60A1	M60A2	M551	M139
Type of Measure				
Norm Referenced				
Criterion Referenced	100%	100%	100%	100%
Evaluation of Training Proficiency	Number of Test Trials or Rounds Per Trainee			
	M60A1	M60A2	M551	
Crew Performance				
Live Fire	7.62mm-500 per crew 50 Cal-150 per crew	7.62mm-500 per crew 50 Cal-150 per crew	7.62mm-500 per crew 50 Cal-150 per crew	40 rds, 20mm 90
Simulated Fire	152mm-18 rds per crew	152mm-18 per crew	152mm-18 per crew	
Dry Fire				
Individual Performance				
Live Fire				
Simulated Fire				
Dry Fire				

Armor

Operational Readiness Training Test - Unit Training

Proficiency Measurement	Percent of Total Evaluation			
	M60A1	M60A2	M551	M139
Type of Measure				
Norm Referenced				
Criterion Referenced	100%	100%	100%	100%
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee			
	M60A1	M60A2	M551	M139
Crew Performance	7.62mm-500 per crew	7.62mm-500 per crew		40 rds, 20mm APIT
Live Fire	50 Cal-150 per crew	50 Cal-150 per crew		90 rds, 20mm TPT
Simulated Fire	150mm-18 rds per crew	152mm-18 per crew		
Dry Fire				
Individual Performance				
Live Fire				
Simulated Fire				
Dry Fire				

ARMOR

DESCRIPTION OF TRAINING DEVICE FOR THE M60A1

Level of Training	AIT
Title and Nomenclature of Training Device	XM55 (3A110) Laser Tank Gunnery Trainer
Description of Training Device	Device which mounts where the M73 coax machine gun mounts and simulates main gun firing. Utilized for qualification firing of Tables I, II and III. Laser beam of light strikes specific target.
Course of Instruction Utilizing Training Device	
Title	Advanced Individual Training (MOS 11E)
Total Number of Hours	
Number of Instructional Hours Scheduled for Training Device	6
Total Amount of Time Each Trainee Uses Device	6 hrs/class
Phase, Period, or block of Course where Device is Used	6th
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Zeroing and initial lay of gun Adjustment of fire Tracking moving targets Manual dexterity manipulation Crew duties for gunner and tank commander

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>60%</p> <p>40%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>\$1,700</p> <p>10</p> <p>Lamplife - 10,000 shots</p> <p>Unknown</p> <p>Less than 1/10 of 1¢</p>

DESCRIPTION OF TRAINING DEVICE FOR THE
M60A1

Level of Training	OBC
Title and Nomenclature of Training Device	M60A1 Tank Turret or M30 Tank Turret Trainer
Description of Training Device	This is either the actual tank turret removed from the hull of an M60 tank or a turret trainer with cutaway portions as a real duplication of an actual turret.
Course of Instruction Utilizing Training Device	
Title	Armor Officer Basic
Total Number of Hours	63
Number of Instructional Hours Scheduled for Training Device	20
Total Amount of Time Each Trainee Uses Device	18
Phase, Period, or Block of Course Where Device is Used	Early stages of gunnery training
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Placing turret into power operation Disassembly & assembly of breech-block Turret maintenance Primary direct fire control system Practicing conduct of fire

Percentage of Total Firing Practice for the Weapon Conducted with the Following:	
Training Device	60%
Live Firing (M60/M60A1 Actual)	100%
Dry Firing	10%
Other Laser mounted in turret sub-caliber	30%
Training Device Costs	
Cost of Each Device	\$98,829
Number of Devices Required per Course	15
Expected Life of Device	Indefinite
Maintenance Costs Per Year	Unknown
Cost Per Round (Where Appropriate)	N/A

ARMOR

DESCRIPTION OF TRAINING DEVICE FOR THE
M551 -M60A1

Level of Training	OBC
Title and Nomenclature of Training Device	XM55 (3A110) Laser Tank Gunnery Trainer
Description of Training Device	Device which mounts where the coax mounts, and simulates main gun firing. Specifically designed for sub-caliber firing/training. Laser beam of light strikes special target.
Course of Instruction Utilizing Training Device	
Title	Armor Officer Basic
Total Number of Hours	
Number of Instructional Hours Scheduled for Training Device	4
Total Amount of Time Each Trainee Uses Device	1
Phase, Period, or Block of Course Where Device is Used	Prior to service firing
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Zeroing/initial lay Adjustment of fire Moving targets (tracking) Manipulation

Percentage of Total Firing Practice for the Weapon Conducted with the Following:	
Training Device	20%
Live Firing	
Dry Firing	20%
Other Laser substitute for sub-caliber firing	60%
Training Device Costs	
Cost of Each Device	\$1,700
Number of Devices Required per Course	10
Expected Life of Device	Lamp life - 10,000 shots
Maintenance Costs Per Year	Unknown
Cost Per Round (Where Appropriate)	Less than 1/10 of 1c

ARMOR

DESCRIPTION OF TRAINING DEVICE FOR THE M60A2

Level of Training	OBC
Title and Nomenclature of Training Device	Trainer Launcher Conduct of Fire for M60A2 Tank
Description of Training Device	M43 contains instructor's control unit, visual effects simulator which simulates missile flight in gunner's sight and relates to his launching and tracking ability of a target.
Course of Instruction Utilizing Training Device	
Title	M60A2 (MOS 11E)
Total Number of Hours	68 (planned but not approved)
Number of Instructional Hours Scheduled for Training Device	68
Total Amount of Time Each Trainee Uses Device	Undetermined
Phase, Period, or Block of Course Where Device is Used	Undetermined
Skills, Functions, Decision Processes, or Computational Procedures Practiced With Training Device	Smooth tracking of targets with missile subsystem made until missile impact. Properly critiquing gunner errors.

Percentage of Total Firing Practice for the Weapon Conducted with the Following:	
Training Device	100%
Live Firing	
Dry Firing	
Other	
Training Device Costs	
Cost of Each Device	\$13,000
Number of Devices Required per Course	5 per class
Expected Life of Device	Unknown
Maintenance Costs Per Year	\$2,500
Cost Per Round (Where Appropriate)	N/A

AR 15-1

DESCRIPTION OF TRAINING DEVICE FOR THE
M60A2

Level of Training	AiT OBC
Title and Nomenclature of Training Device	Turret Trainer M37
Description of Training Device	Trainer simulating and actual M60A2 TRT 41,000 pound turret trainer for placing turret into operation, primary direct fire control system, practicing conduct of fire, sub-caliber firing, loading, bore-sighting and auxiliary fire control.
Course of Instruction Utilizing Training Device	
Title	AOB
Total Number of Days	-
Number of Instructional Hours Scheduled for Training Device	72
Total Amount of Time Each Trainee Uses Device	8
Phase, Period, or Block of Course Where Device is Used	Throughout
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Turret familiarization Prep fire Auxiliary fire control Conduct of fire - day Conduct of fire - night

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>\$335,484</p> <p>5</p> <p>Unknown</p> <p>In use only a short time</p> <p>N/A</p>

ARMOR

DESCRIPTION OF TRAINING DEVICE FOR THE
M551, M60A2

Level of Training,	UT - OBC
Title and Nomenclature of Training Device	Target Conduct of Fire Trainer, M42
Description of Training Device	Provides the target device for the M41 conduct of fire launcher system for the Sheridan M551 AR/AAV and for the M42 launcher for the M60A2 Tank
Course of Instruction Utilizing Training Device	
Title	Armor Officer Basic and B.U.T.
Total Number of Hours	
Number of Instructional Hours Scheduled for Training Device	2 hrs - AOB / 8 hrs - BUT
Total Amount of Time Each Trainee Uses Device	1 hr - AOB / 4 hrs - BUT
Phase, Period, or Block of Course Where Device is Used	AOB - 10th-11th BUT - 4,5,6
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Smooth tracking targets with missile subsystem made until missile impact. Possessing knowledge to properly critique gunner errors, if any.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>\$13,000</p> <p>1</p> <p>Unknown</p> <p>\$ 2,500</p> <p>N/A</p>

DESCRIPTION OF TRAINING DEVICE FOR THE M551

Level of Training	OBC
Title and Nomenclature of Training Device	XM40 Sheridan/Shillelagh turret trainer
Description of Training Device	Metallic turret size trainer which completely simulates M551 turret interior. An attached 16mm movie projector places a moving tank into the gunner's sight for missile firing simulation.
Course of Instruction Utilizing Training Device	
Title	Armament controls and equipment and conduct of fire -M551
Total Number of Hours	6
Number of Instructional Hours Scheduled for Training Device	3
Total Amount of Time Each Trainee Uses Device	1-1/2 hours
Phase, Period, or Block of Course Where Device is Used	2nd-8th (M551 block)
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Complete crew duties of gunner Vehicle commander and loader Emphasis on missile gunnery Techniques and loading Reloading ammunition

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other BOT Conduct of Fire Trainers</p>	<p>20%</p> <p>20%</p> <p></p> <p>60%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>\$275,000</p> <p>8-12</p> <p>10 years (approx.)</p> <p>Unknown</p> <p>N/A</p>

ARMO

DESCRIPTION OF TRAINING DEVICE FOR THE M551

Level of Training	OBC
Title and Nomenclature of Training Device	Trainer Launcher Conduct of Fire for the M551-M41
Description of Training Device	M41 contains instructor's control unit, visual effects simulator which simulates missile flight in gunner's sight and relates to his launching and tracking abilities of a target.
Course of Instruction Utilizing Training Device	
Title	Sheridan/Shillelagh familiarization
Total Number of Hours	4
Number of Instructional Hours Scheduled for Training Device	2
Total Amount of Time Each Trainee Uses Device	1
Phase, Period, or Block of Course Where Device is Used	10th - 11th
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Smooth tracking of targets with missile subsystem made until missile impact. Properly critiquing gunner errors.

Percentage of Total Firing Practice for the Weapon Conducted with the Following: Training Device Live Firing Dry Firing Other	100%
Training Device Costs Cost of Each Device Number of Devices Required per Course Expected Life of Device Maintenance Costs Per Year Cost Per Round (Where Appropriate)	\$22,000 3-5 Unknown \$2,500 N/A

ARMOR

DESCRIPTION OF TRAINING DEVICE FOR THE M551

Level of Training	OBC
Title and Nomenclature of Training Device	Burst on Target - Conduct of Fire Trainer
Description of Training Device	This metal/wooden trainer (4'x2' x1/3') houses a field of view screen, a reticle superimposed over the field of view and simulated controls and switches that are found in the M551 gunner and loader positions.
Course of Instruction Utilizing Training Device	
Title	Conduct of Fire M551
Total Number of Hours	4
Number of Instructional Hours Scheduled for Training Device	1
Total Amount of Time Each Trainee Uses Device	1 Hour
Phase, period, or Block of Course Where Device is Used	5th - 8th
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Loader performs proper crew duties Gunner turns on turret power Gunner selects proper ammunition Gunner determines target range Gunner performs burst on target

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other - Laser Fire</p>	<p>40%</p> <p>20%</p> <p></p> <p>40%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>\$98.00</p> <p>3-7 (Avg class -40)</p> <p>Depends on class size</p> <p>\$5.00 (est.)</p> <p>N/A</p>

ARMOR

DESCRIPTION OF TRAINING DEVICE FOR THE M551

Level of Training	UT
Title and Nomenclature of Training Device	M41/42 Conduct of Fire Trainer (Shillelagh)
Description of Training Device	M41 contains instructor's control unit and visual effects simulator which simulates missile flight in gunner's sight and relates his launching ability. M42 is an infra-red tower assembly on a target M551 used solely as a system reference light for target tank.
Course of Instruction Utilizing Training Device	
Title	Basic Unit Training, M551 crewman
Total Number of Hours	18
Number of Instructional Hours Scheduled for Training Device	18
Total Amount of Time Each Trainee Uses Device	6
Phase, Period, or Block of Course Where Device is Used	Preparation - for annual gunnery qualification
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Smooth tracking targets with missile subsystem made until missile impact. Possessing knowledge to properly critique gunner errors, if any.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>95%</p> <p>5%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>M41-\$22,000 / M42-\$13,000</p> <p>2-M41's / 1-M42</p> <p>Unknown</p> <p>\$5,000 (approx.)</p> <p>N/A</p>

APPENDIX D

ARMOR

DESCRIPTION OF AIT WEAPONS TRAINING FOR THE M60A1 TANK

INTRODUCTION

DESCRIPTION OF WEAPON SYSTEM

The M60A1 tank (currently referred to as the Main Battle Tank) is the principle tank issued to the field for all active Army Armor battalions and separate Armor companies. The tank weighs 106,000 pounds and is manned by a four-man crew (tank commander, gunner, loader, and driver). The armament consists of a 105mm gun (M68) with a supply on board of 63 rounds of 105mm (main gun) ammunition. A 50 cal machinegun (M85) capable of engaging aircraft and personnel targets is mounted on the tank. The tank also has a coaxial 7.62mm machinegun which is used for destroying personnel targets. A gun and sight stabilization system for the main gun has been developed and 80 tanks will be retrofitted with this stabilizer. There are several other components under development, to include a laser range finder which will replace the coincidence range finder, as a part of the Product Improvement Program (PIP) for the M60A1 tank. The tank is equipped with night vision devices and a searchlight to enhance engagement of targets at night.

TACTICAL MISSION

The mission of the M60A1 tank is to close with and destroy enemy forces, using fire, maneuver and shock effect.

The 105mm gun system is the primary weapon system of the tank battalion and has the capability to destroy heavy armored vehicles at a range in excess of 2,000 meters.

Units equipped with the M60A1 tank are especially suited to execute the following missions:

1. Destruction of hostile armor.
2. Deep penetration to seize decisive objectives.

3. Employment in the mobile reserve of a large unit to conduct spoiling attacks, counterattacks, and striking force actions.
4. Envelopment and destruction of a hostile force.
5. Acting as a part of a covering force in retrograde movements in offensive and defensive action.
6. Acting as a part of an exploiting force to take advantage of the success of other friendly units or nuclear weapons.
7. Pursuit and destruction of a hostile force.

CURRENT ARMY ORGANIZATION OF WEAPONS AND PERSONNEL

The M60A1 tank, with its crew of four, is organized into a five-tank platoon. The platoon is organized into a three-tank section, normally under the direct employment of the platoon leader and a two-tank section under the platoon sergeant. The tank company is composed of three tank platoons (15 tanks) with two tanks in company headquarters. There are three tank companies in the tank battalion and there are also three tanks in battalion headquarters for a total of 54 tanks in a battalion. All Army Infantry divisions have at least one tank battalion, most mechanized Infantry divisions have four tank battalions, and most Armored divisions have six tank battalions. There are several non-divisional tank battalions.

TACTICAL EMPLOYMENT

Tank units at platoon, company, and battalion level commonly fight as a combined arms team with Infantry, usually mechanized Infantry, supported by Field Artillery and probably Engineers. The combined arms team of tank and Infantry constitute the principle maneuver elements of the land battle. Some of the aspects of tactical employment are listed below.

1. Tank units are capable of maneuver and control of tremendous armor protected fire power on the battlefield.
2. Tank units can move rapidly from one area to another and decisively engage the enemy at a critical point.
3. The M60A1 tank can withstand to a significant degree the effects of a nuclear explosion.

4. The tank can conduct heavy assault actions against enemy positions.
5. Tanks can disperse and concentrate rapidly.
6. Tanks can rapidly engage the enemy and quickly disengage from the enemy.

TRAINING CONTENT

In selecting training content for crew members of the M60A1 tank, various methods were used in determining performance requirements, developing mission profiles, and arriving at proficiency standards.

TASK ANALYSIS PROCEDURES

During discussions between members of the U.S. Army Armor School, U.S. Army Armor Training Center, U.S. Army Armor and Engineer Board, and HUMPRO, it could not be determined that the Army had conducted a formal task analysis of performance requirements for crew members of the M60A1 Tank. It was generally concluded that performance requirements were determined by -- questionnaire (5%), individual interview (5%), observation (10%), and conference or committee (80%). The determination of these requirements has been evolutionary in nature because of the above procedures plus feedback from engineer and service tests conducted by the U.S. Army Armor and Engineer Board, from troop tests conducted in the field by tank units, and from experience gained by the Weapons Department, U.S. Army Armor School. During various research efforts for the Army, HUMPRO has conducted evaluations to determine performance requirements for tank crew members. As a result of Work Unit SHOCKACTION, Technical Report 47, "The Determination of Job Requirements for Tank Crew Members" was completed, and Technical Report 59, "An Improved Advanced Individual Training Program for Armor," addressed the performance requirements for crew members of the M48A1 Tank. This effort was followed by a series of picture guides for skills of the crewman of the M48A1 Tank. Later the Army

published three 17 series training circulars (picture guides) for crew members of the Tank 105mm Gun M60.

HumRRO also conducted similar work under Work Unit MBT. This effort addressed crew duties for crew members of the US/FRT MBT, M60A1E2, M551 and M50A1 vehicles.

UTILIZATION OF MISSION PROFILES

Mission Profiles used in the development of the M60A1 tank could not be identified. However, the plan of service test for the add on stabilizer for the M60A1 included a mission profile, and from this document many crew performance requirements can be derived.

AMOUNT OF TRAINING REQUIRED FOR PROFICIENCY

The number of practice rounds required for an acceptable level of firing proficiency has been determined by the Army to be (per crew member) as follows:

Verification of zero	-	1 rd	TPT
Table IV (Stationary tank/ stationary target, day)	-	2 rds	DEP
	-	2 rds	TPT
Table V A (Stationary tank/ moving target, day)	-	4 rds	TPT
Table V B (Stationary tank/ moving target, night)	-	4 rds	TPT

This determination has been made primarily from feedback from initial courses. No research effort could be identified which addressed the amount of training required for an acceptable level of firing proficiency.

At the present time, when a trainee completes the firing of a table, he continues to the next table whether or not he successfully engaged a target. However, HumRRO's ongoing Work Unit ATC-PERFORM is developing performance criteria on a GO/NO GO basis which will

require the trainee to successfully engage a specified number of targets, under varying conditions, in order to advance to the next phase of Advanced Training.

TRAINING METHODS

This section is limited to those practical exercises in Advanced Individual Training, which permit the trainee to practice some aspect of the firing sequence. For the following practical exercises, see Table D-1 for the number of trials or rounds per trainee and the instructional methods used.

PERIOD 8 - During this period, the trainee uses the non-ballistic reticle of the periscope to acquire sight pictures and apply burst on target (BOT) fire adjustment for stationary and moving targets.

PERIOD 9 - During this period, the trainee uses the gunner's telescope to acquire sight pictures and apply BOT for stationary and moving targets.

PERIOD 17 & 18 - During this period, the trainee uses the gunner's control to bore-sight and zero the main gun and fire control instruments, respond to tank commander's fire command, index the proper ammunition on the computer, acquire proper initial sight picture for stationary targets, apply burst-on-target method of fire adjustment (with LASER mounted in M-73 position) and apply alternate method of adjustment in response to the tank commander's subsequent fire command. All firing is done using the LASER and no live ammunition is used. This is a stationary tank and target range.

PERIOD 19 - During this period, the trainee fires the main gun at stationary targets using the gunner's primary and secondary sight and applies misfire procedures.

PERIOD 20 - During this period, the trainee fires the main gun at moving targets using the gunner's primary and secondary sights.

PERIOD 21 - During this period, the trainee fires the main gun using the secondary fire control system at moving targets during day/night, utilizing artificial illumination.

PERIOD 23 - During this period, the trainee fires the machinegun (M73) from a moving tank while functioning as a crew member.

PROFICIENCY MEASUREMENT

END OF COURSE EVALUATION

Performance Measures. This description of the performance measures used in the evaluation will deal only with the tank gunnery aspects of evaluating personnel trained in MOS 11B10. Trainees are required to perform the following basic skills on a GO/NO GO basis. The complete evaluation is performed on a "Hands-On" basis utilizing actual equipment and training devices, and it is known as the Preliminary Gunnery Test. The evaluation requires 15 hours or 1011.

Firing of modified, sub-caliber Table I with the Laser sub-caliber device (Zeroing and Initial lay).

1. Table II modified, with Laser sub-caliber device (adjustment of fire)
2. Table II modified, utilizing Laser sub-caliber device (moving target)
3. Table IV modified, utilizing the 105mm main gun (zeroing the weapon and firing at stationary targets)
4. Table V modified, utilizing the 105mm main gun (firing at moving targets)
5. Table V B modified utilizing the 105mm main gun with searchlight (firing at moving targets at night)
6. Table VI modified utilizing the M73 coaxial machinegun and the M89 cal 50 machinegun. This is the only crew exercise fired by trainees.

An end of course evaluation is conducted for all trainees. Each trainee passes through eight test stations. Five of the eight stations deal directly with tank gunnery on the tank and are as follows:

1. Main gun bore-sighting and turret operation
2. Control of fire

3. Ammunition identification and replenisher tape located with weapons stations
4. Coaxial machinegun (M71)
5. 50 caliber machinegun (M39)

DESCRIPTION OF THE CRITERION LEVEL OR STANDARD FOR ACCEPTABLE PERFORMANCE

Performance Standards. Students are divided into groups and each group is sent to a test station. Students are rotated from station to station as directed by the test officer.

Students who receive an unsatisfactory score on a GO/NO GO basis on any performance measure cannot receive a satisfactory rating for that station or the entire examination. The trainee must receive remedial training prior to retesting of that particular station.

Score cards are reproduced at AG Publications USAARMC and issued to the unit prior to the test. Upon completion of the examination, students return score cards to the officer in charge at the AIT Brigade Instructor Committee.

Validity of Performance Measures. The end of course performance measures appear to provide a valid indication of the level of proficiency required for a tank loader in combat. It should be pointed out that the performance objective of the proficiency test states that "The soldier can perform basic skills required for qualification as an Armored Crewman, MOS 11E10." TCE 17-37H "Tank Company" states that an 11E10 is a tank crewman "loader" grade E-3. The AIT trainee is familiarized with two other crew duties, Tank Driver 11E20 (E-5), and Tank Gunner 11E20 (E-5).

Table D-1

Description of AIT for the M60A1 (MOS-11E10)

Period of Instruction	Scope or objective of period	Percentage of period conducted with C, D, or PE.	Number of training trials per student per position during each PE.	Utilization of training devices, live firing, mock-ups or hands-on actual equipment during PE.
Period 1 - 1 Hr.	Main Gun & Recoil	100% Conf	N/A	Hands-on
Period 2 - 1 Hr.	Replenisher System	5% Conf 95% PE	1	Hands-on
Period 3 - 2 Hr.	Loading Procedures	10% Conf 90% PE	1	
Period 4 - 1 Hr.	Turret Opns	10% Conf 45% PE 45% D	1	Hands-on
Period 5 - 1 Hr.	Gun Tube Maint	5% Conf 95% PE	1	Hands-on
Period 6 - 2 Hr.	Breechblock Maint	20% Conf 80% PE	1	Hands-on
Period 7 - 2 Hr.	Intro to Tank Gunnery	5% Conf 95% PE	1	Hands-on
Period 8 - 2 Hr.	Direct Fire Primary Sight	50% Conf 50% PE	4	Hands-on

Table D-1
(cont'd)

Period of Instruction	Scope or objective of period	Percentage of period conducted with C, D, or PE.	Number of training trials per student per position during each PE.	Utilization of training devices, live firing, mock-ups or hands-on actual equipment during PE.
Period 9 - 2 Hr.	Direct Fire Secondary sight	50% Conf 50% PE	4	Hands-on
Period 10 - 2 Hr.	Direct Fire Daylight I	5% Conf 95% D	N/A	Hands-on
Period 11 - 2 Hr.	Direct Fire	10% Conf	1	Hands-on
Period 12 -	Stabilized Gunnery	75% PE 25% Conf	9	Hands-on Dry Fire
Period 13 - 1 Hr.	Breechblock Review	5% Conf 95% PE	1	Hands-on
Period 14 - 2 Hr.	Boresight & Zero	5% Conf 95% PE	1	Hands-on
Period 15 - 2 Hr.	Main Gun Ammo	10% Conf 70% D 20% PE	1	Hands-on
Period 16 - 7 Hr.	PGE	5% Conf 95% PE	1	Hands-on

Table D-1
(cont'd)

Period of Instruction	Scope or objective of period	Percentage of period conducted with C, D, or PE.	Number of training trials per student per position during each PE.	Utilization of training devices, live firing, mock-ups or hands-on actual equipment during PE.
Period 17 - 4 Hr.	Table I & II	10% Conf 90% PE	34	Hand-on (Laser)
Period 18 - 2 Hr.	Table III	10% Conf 90% PE	17	Hand-on (Laser)
Period 19 - 3 Hr.	Table IVA	5% Conf 95% PE	7	Hand-on (Live Fr)
Period 20 - 3 Hr.	Table VA	5% Conf 95% PE	4	Hand-on (Live Fr)
Period 21 - 3 Hr.	Table VB	5% Conf 95% PE	4	Hand-on (Live Fr)
Period 22 - 4 Hr.	MG Fam. Fire	3% Conf 97% PE	1	Hand-on (Live Fr)
Period 23 - 8 Hr.	Table VIA	3% Conf 97% PE	1	Hand-on (Live Fr)

ARMOR

DESCRIPTION OF AIT WEAPONS TRAINING FOR THE M60A2 TANK

INTRODUCTION

DESCRIPTION OF WEAPON SYSTEM

The M60A2 Tank (formally identified as the M60A1E2) has not as yet been fielded. Six tanks were made available in 1971 to the U.S. Army Armor and Engineer Board (TECOM) for testing. It was determined that before issuance to troops, a troop test of the M60A2 would be conducted by a TO & E tank battalion. The Armor Center received M60A2 tanks for training instructors in the Weapons Department of the Armor School. After this instruction was completed, 54 2-man tank crews (that were qualified MOS 11E tank crewman) were sent to the Weapons Department of the Armor School for familiarization on the M60A2 tank in order to conduct the above mentioned M60A2 tank troop test. These crew members were tank commanders and gunners. The familiarization course was three weeks in length. The troop test as of this date has not begun. The familiarization training of the 54 crews (108 men) by the Armor School is the basis for this report.

The M60A2 tank from the turret ring down is almost identical to the M60A1 tank. The turret, however, is of completely new design and possesses many components not found in earlier model tanks. The main armament is the 152mm gun/launcher similar to that found in the M551 AR/AAV. The tank also has an M85 caliber 50 machinegun, and a laser range finder. Like the M60A1 tank, the M60A2 has night vision devices and a searchlight.

TRAINING CONTENT

In selecting training content for crew members of M60A2 tank, various methods were used in determining performance requirements,

developing mission profiles, and arriving at proficiency standards.

TASK ANALYSIS PROCEDURES

During discussions between members of the U.S. Army Armor School, U.S. Army Armor Training Center, U.S. Army Armor Engineer Board and HumRRO, it could not be determined that the Army had conducted a formal task analysis of performance requirements for crew members of the M60A2 Tank. It was generally concluded that performance requirements were determined by -- individual interview (15%), observation (10%), and conference or committee (85%). The determination of these requirements has been evolutionary in nature because of the above procedures plus feedback from engineer and service tests conducted by the U.S. Army Armor and Engineer Board, from troop tests conducted by tank units, and from experience gained by the Weapons Department, U.S. Army Armor School.

In the past HumRRO has conducted research for the Army in which performance requirements were identified. These efforts primarily addressed "gun" tanks rather than "gun/missile" tanks. However, with the advent of the US/FRG MBT and the M551 AR/AAV, HumRRO's efforts included addressing the problems of combat vehicle missile systems. As a result of Work Unit MBT, Research By-Product, "US/FRG MBT-70 Crew Functional Procedures and Performance Standards" and Research By-Product "Crew Duties and Tasks for Operation of the M551" addressed the problem of determining performance requirements for these two vehicles.

During the summer of 1973, the Armor School developed a three week familiarization course on the M60A2 tank. The course was given to crew members who would participate in an intensified confirmatory troop test. The development of this course was done primarily by conference/committee and did not include formal task analysis research. No additional effort in determining performance requirements for the M60A2 Tank was identified.

UTILIZATION OF MISSION PROFILES

A mission profile for the M60A2 tank was developed by the U.S. Army Combat Developments Command in 1969 and 1970. In the narrative

the vehicle is involved in eleven different tactical engagements, requires maintenance and resupply operations, and operates over various types of terrain. The US/FRG MBT mission profile was used as a reference in developing the narrative for the M60A2 profile.

During the development of the US/FRG MBT, mission profiles for the vehicle were developed. One of these profiles entitled "MBT-70 Mission Narrative, Revision of 1 June 1969" was published 26 June 1969 by General Motors. It defines the capabilities, battlefield, requirements, and life cycle requirements of the MBT-70 weapon system. During the narrative the vehicle is involved in ten different tactical engagements, requires maintenance and resupply operations, and operates over various types of terrain. From these types of documents crew performance requirements can be derived and tasks determined. The amount of detail in the narrative is sufficient to accomplish task determination, however, reaching the end product would require considerable effort.

AMOUNT OF TRAINING REQUIRED FOR PROFICIENCY

The number of practice rounds required for an acceptable level of firing proficiency has been determined by the Army to be 130 rounds of TOPT and 1 Shillelagh missile per M60A2 crew. Modified firing Tables IV, V and VI were fired during daylight hours. When a crew completed firing the authorized rounds for each table it moved to the next table regardless of proficiency attained. (It must be remembered that the POI in question was to familiarize a group of trained M60A1 crewmen during a specified time and with a specified number of training rounds in preparation for the conduct of an intensified confirmatory troop test.) As the M60A2 system is integrated into AIT, performance requirements will be determined.

TRAINING METHODS

The course of instruction "M60A2 INTENSIFIED CONFIRMATORY TEST TRAINING" and a Draft POI were utilized for the M60A2 Familiarization

training. See Table D-2 for a detailed description of the instructional methods and the number of trials or rounds per trainee.

COMPOSITION OF PRACTICAL EXERCISES

- | | |
|-----------------------------------|-------|
| 1. Demonstration | - 0% |
| 2.* Practice with training device | - 2% |
| 3. Laser firing | - 62% |
| 4. Live firing | - 36% |

* By utilizing the turret trainer M37, the laser sub-caliber device, and the conduct of fire trainers M42 and M43 it is believed that good use is made of training devices. However, as more experience is gained with the M60A2 Tank, further study should be made to minimize ammunition expenditures. With the new capability to fire the main gun ammunition from a moving tank (stabilization), this area should be further developed. A device might be developed to simulate a moving tank.

PROFICIENCY MEASUREMENT

END OF COURSE EVALUATION

Performance Measures. The performance testing for the 54 (2 man) crews from Fort Hood was based on an evaluation of all personnel as Tank Commanders and Gunners. Individuals and crews were required to perform basic skills on a GO/NO GO basis. Most of the evaluation was performed with "Hands-On" actual equipment and training devices such as the M37 Turret Trainer and the XM55 Laser Sub-Caliber device. A total of 45 1/2 hours was devoted to this evaluation as follows:

Subject	Hours
1. Preliminary Gunnery Examination	8
2. Sub caliber firing tables IA, IIA and IIIA. Tables fired twice, one for practice and one for record	4
3. Firing of gunnery tables IVA and VA	8

Subject	Hours
4. Firing from a moving tank at a stationary and moving target (not scored)	8
5. Firing Table VIA, crew machinegun exercise from a moving tank	8
6. Firing Table VIIA, scored to determine crew proficiency of all weapons	8
7. Written examination	1 1/2

Performance Standards. Scoring of the preliminary gunners Examination and Tables I A through VII A were based on the criteria established in Appendix C "M551/Shillelagh Gunnery" Section VIII and Appendix F "Stabilized Gunnery" FM 17-12 "Tank Gunnery" dated November 1972.

Ammunition Requirements for the M60A2 Familiarization were as follows:

CTA Item No.	Description	Items Per 2 Man Crew
1263	Cartridge Ball 7.62mm TR 4-1 MLB	3,000
1470	Cartridge ball 50 cal. TR 4-1 MLB	2,000
2867	Cartridge 152mm	52
	Guided missile 152mm Shillelagh	1
	Grenades M176	6

Validity of Performance Measures. The performance measures utilized may not provide a valid indication of the level of proficiency required for combat because the crew members only fired qualification Tables IA through VII A (daylight). They did not fire Tables IV B through VII B (night firing) nor did they fire Tables VIII A and VIII B which are the crew proficiency day and night tables. It should be pointed out, however, that this was an M60A2 familiarization course and not an MOS producing course.

Table D-2

Description of M50A2 Intensified Confirmatory Test Training

Period of Instruction	Scope or objective of period	Percentage of period conducted with C, D, or PE	Number of training trials per student per position during each PE	Utilization of training devices, live firing, mock-ups, or hands-on actual equipment during PE
<p>Period 1</p> <p>Preliminary Gunnery Examination</p>	The PGE is conducted to test the crewman's knowledge of turret-mounted weapons, fire control systems, and gunnery procedures.	All PE	In cases, three training trials per student; if any requirement was not passed the student kept doing it until the required accuracy was obtained.	Most of this examination is hands-on equipment. However, the M42/43 COFT was used. M37
<p>Period 2</p> <p>Subcaliber Firing Tables IA, IIA, IIIA</p>	Subcaliber exercises are conducted using the (LWFS); firing single shot to simulate firing of the main gun. Table IA tests the crewman's ability to: (1) zero main gun, (2) engage targets	All PE	Each student fired once for practice and once for record.	XM55(3A110) laser tank gunnery trainer.

Table D-2
(cont'd)

Period of Instruction	Scope or objective of period	Percentage of period conducted with C, D, or PE	Number of training trials per student per position during each PE	Utilization of training devices, live firing, mock-ups, or hands-on actual equipment during PE
Period 2 (cont'd)	during periods of good visibility and poor visibility. Table IIA tests the crewman's ability to: (1) apply primary method of adjustment (BOT), (2) apply alternate method of adjustment. Table IIIA tests crewman's ability to: (1) track, lead, and engage moving targets, (2) adjust fire on moving targets.			
Period 3 Gunnery Table IVA Stationary Target Exercise	Table IVA tests the crewman's ability to: engage stationary targets using all of the tank mounted weapons.	All PE	Each student fired twice from the gunner and commander positions.	Live fire

Table D-
(cont'd)

Period of Instruction	Scope or objective of period	Percentage of period conducted with C, D, or PE	Number training trials per student per position during each PE	Utilization of training devices, live firing, mock-ups, or hands-on actual equipment during PE
Period 4 Gunnery Table VA Stationary Tank-Moving Target Exercise	Table VA tests the crewman's ability to: engage moving targets using all of the tank-mounted weapons.	All PE	Each student fired twice from the gunner and commander positions.	Live fire
Period 5 Stabilized Gunnery Exercise	Stabilized gunnery tests the crewman's ability to: engage stationary and moving targets with main armament and machine-gun from a moving tank.	All PE	Each student fired twice from the gunner and commander positions.	Stabilized dry run, live fire; stabilized command stabilized main gun.
Period 6 Gunnery Table VIA	Table VIA tests the crewman's ability to: engage stationary and moving targets with the coax and the Cal .50 machinegun.	All PE	One	Live fire

APPENDIX E

FIELD ARTILLERY, BRIEF SURVEY

105mm Howitzer

Instructional Method	Hours of Instruction For Each Level of Training					
	AIT		NCO		OFF	Unit
	13A10	13E20	Basic*	Advance	Basic	Training
1. Lecture	14	2.5				
2. Conference			8.1	25.7	8.8	
3. Demonstration	10	1.5	.6	2		
4. Practical Exercise	99	5	31.2	19.3	44.8	
5. Peer Instruction						
6. Instructor Guidance and Critique With Small Group	26					
7. Individualized, Self-Paced						
8. Group Paced						
9. Self Study						
10. Guest Speaker						
11. Case Study						
12. Review			.9			
13. Computer-Assisted Instruction						
14. Programmed Instruction	7					
15. Other: _____						
Total Hours of Instruction	156	9	40.8	37	53.6	

*Primarily for 13B section of class.

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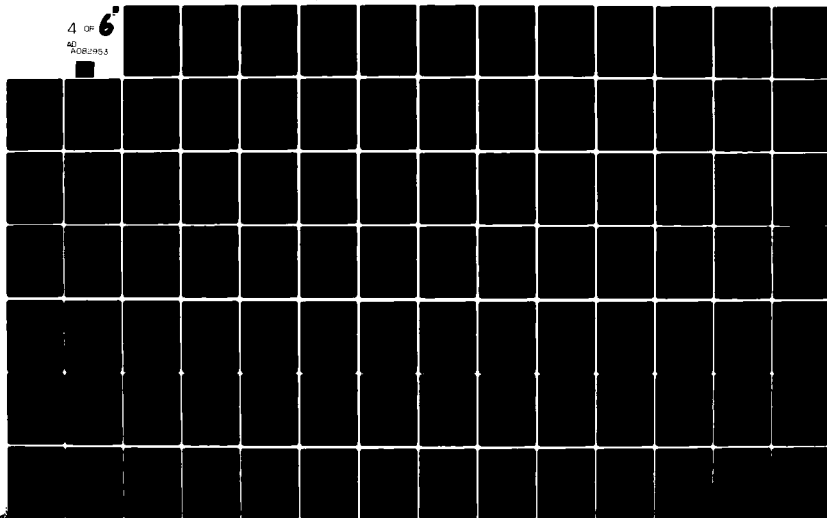
HUMAN RESOURCES RESEARCH ORGANIZATION ALEXANDRIA VA F/G 3/9
SURVEY OF ARMY WEAPONS TRAINING AND WEAPONS TRAINING DEVICES.(U)
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FIELD ARTILLERY

105mm Howitzer

Instructional Media	Course Objectives Achieved With Various Media					
	AIT		NCO		OFF Basic	Unit Training
	13A10	13E20	Basic	Advance		
1. Field Trips				17		
2. Training Devices			4.2		4.2	
3. Audio Tape Recordings						
4. Transparencies						
5. Filmstrips						
6. Still Pictures						
7. Printed Material	7					
8. Television			.1		.2	
9. Motion Pictures	3.4					
10. Actual Equipment	145.6	9	30	17	45.2	
11. Instructor			6.5	3	4	
12. Other: _____ _____						
Totals	156	9	40.8	37	53.6	

FIELD ARTILLERY

105mm Howitzer

Practical Exercises	Amount of Practice					
	AIT		NCO		OFF	Unit
	13A10	13E20	Basic	Advance	Basic	Training
CREW DRILL						
<u>Live Fire</u>						
Artillery Team	100/D(1)	16/D			631/P 2/S (11)	(12)
Crew (direct)	4/S(2)					
Crew (indirect)	3.5/S 80/P(3)		15/S(5) 4.8/S(6)	7HE/S(8)	4/S(9) 4/P(10)	
FA Bn in Combat					2/S 879/P	
Firing Btry Procedures					20/P	
<u>Simulated Fire</u>						
Crew (RSOP)					2,14.5/S	
FA Bn in Combat					240,14.5 /P	

FIELD ARTILLERY
105mm Howitzer (Cont'd)

Practical Exercises	Amount of Practice					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
INDIVIDUAL DRILL						
<u>Live Fire</u>						
Gunner & C.of Sec. Duties of Btry XO			15/S(5)	7/S(8)	4/S(9) 4/P(10)	
Target Acquisition Crater & Frag. Analysis				50/D	.66/S 80/P	
<u>Simulated Fire</u>						
Gunner & Asst Gunner	5,7.62/S		5,7.62/S 12,14.5/S			
Area & Precision Fire Missions					11,14.5/S	

- (1) /D - per demonstration
- (2) /S - per student
- (3) /P - per practical exercise
- (5) 13B training only and same rounds
- (6) 13E training only
- (8) Same rounds
- (9) Same rounds
- (10) Same rounds

(11) In addition to the allocations noted, the Field Artillery Officer Basic Course includes two demonstrations:

(a) Field Artillery Firepower and Air Firepower. Cost per demonstration \$268,212.42; conducted 2 times per year; attended by 3,181 students (includes not only OBC attendees but all Field Artillery students in residence).

(b) Mechanized Rifle Company Team in the attack. Cost per demonstration \$73,600.30; conducted 3 times per year; attended by 4,613 students (includes not only OBC attendees but all Field Artillery students in residence). All figures reflect FY 74 projections.

(12) See attached pages for ATT/ORTT ammunition support requirements for 105mm How Battery and Battalion.

FIELD ARTILLERY

105mm Howitzer

End of Course Proficiency Measurement	Percent of Total Evaluation					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
1. Type of Measure						
a. Norm Referenced (curve)			40	100	100	
b. Crit. Ref. (go/ no go)	100		60			100
2. Type of Evaluation						
a. Paper and Pencil Test			40	100	75	
b. Hands-On, Part Task	100		60		25	
c. Performance with Training Devices						
d. Crew Drill, Gun- ner's Test						
e. Integrated Test of Terminal Per- formance Require- ments)						100
f. Other: _____ _____ _____						

FIELD ARTILLERY

105mm Howitzer

End of Course Proficiency Measurement	Test Trials or Rounds Per Trainee					
	AIT		NCO		OFF	Unit Training
	13A10	13E20	Basic	Advance	Basic	
Evaluation of Firing Proficiency						
Crew Performance						
Live Fire						100%
Simulated Fire						
Dry Fire						
Individual Perform- ance						
Live Fire						
Simulated Fire						
Dry Fire	100%		40%		25%	

FIELD ARTILLERY

105mm Howitzer

Training Management Considerations	AIT		NCO		OFF	Unit Training
	13A10	13E20	Basic	Advance	Basic	
Prescribed Inst/Stu. Ratio	1/10	1/10	1/25* 1/12**	1/25* 1/12**	1/25* 1/12**	
Time Period Over Which Instruction Is Scheduled	7 wks	7 wks	12 wks	13 wks	13 wks	
Total Hours Allocated For Course	280	280	490	523	649.8	
Hours For Training	156	9	40.8	37	53.6	
Hours For Evaluation	9		4.8	1.5	2	

*Conference

**Field

FIELD ARTILLERY

155mm Howitzer

Instructional Method	Hours of Instruction For Each Level of Training					
	AIT		NCO		OFF	Unit
	13A10*	13E20	Basic**	Advance	Basic	Training
1. Lecture	1					
2. Conference	16		7.5	2.5	1.9	
3. Demonstration			.5			
4. Practical Exercise	27		23.5		58.7	
5. Peer Instruction						
6. Instructor Guidance and Critique With Small Group	4				1.4	
7. Individualized, Self-Paced						
8. Group Paced						
9. Self Study						
10. Guest Speaker						
11. Case Study						
12. Review			1.8			
13. Computer-Assisted Instruction						
14. Programmed Instruction						
15. Other: _____						
Total Hours of Instruction	48		33.3	2.5	66	

*Instruction for 155mm How, 8 Inch How and 175mm Gun is given together. In the study, it is all reflected in each section.

**Primarily for 13B section of class.

FIELD ARTILLERY

155mm Howitzer

Instructional Media	Course Objectives Achieved With Various Media					Unit Training
	AIT		NCO		OFF Basic	
	13A10*	13E20	Basic	Advance		
1. Field Trips	8					
2. Training Devices						
3. Audio Tape Recordings						
4. Transparencies						
5. Filmstrips						
6. Still Pictures						
7. Printed Material						
8. Television			.1			
9. Motion Pictures						
10. Actual Equipment	39		23.7			60.7
11. Instructor	1		9.5	2.5		5.3
12. Other: _____						
Totals	48		33.3	2.5		66

*Instruction for 155mm How, 8 Inch How and 175mm Gun is given together. In this study, it is all reflected in each section.

FIELD ARTILLERY

155mm Howitzer

Practical Exercises	Amount of Practice					Unit Training
	ATT		NCO		OFF	
	13A10	13E20	Basic	Advance	Basic	
CREW DRILL						(7)
Live Fire (Artillery Team) (Crew) (Artillery Team Hip Shoot) (Firing Battery) Simulated Fire	16/D(1) 1.5/S(2)		88/P(3) 18.0/S(4) 88/D		5/S(6) 132/P	
Dry Fire						
INDIVIDUAL DRILL						
Live Fire Gunner & Chief of Sect. Duties XO & C. of Sect.			9/S(5)		5/S(6)	
Simulated Fire						
Dry Fire						

- (1) /D - per demonstration
 (2) /S - per student
 (3) /P - practical exercise
 (4) 13B & 13E training only

- (5) Part of 13.8 rounds listed above
 (6) Same rounds
 (7) ATT/ORTT ammunition support same
 as for 105mm How Battery and
 Battalion

FIELD ARTILLERY

155 mm Howitzer

End of Course Proficiency Measurement	Percent of Total Evaluation					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
1. Type of Measure						
a. Norm Referenced (curve)			34	100	100	
b. Crit. Ref. (go/ no go)	100		66			100
2. Type of Evaluation						
a. Paper and Pencil Test			34	100	75	
b. Hands-On, Part Task			66		25	
c. Performance with Training Devices						
d. Crew Drill, Gun- ner's Test						
e. Integrated Test of Terminal Per- formance Require- ments)	100					
f. Other: _____						

FIELD ARTILLERY

155mm Howitzer

End of Course Proficiency Measurement	Test Trials or Rounds Per Trainee					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
Evaluation of Firing Proficiency						100%
Crew Performance						
Live Fire						
Simulated Fire						
Dry Fire						
Individual Perform- ance						
Live Fire						
Simulated Fire						
Dry Fire	100%		66%		25%	

FIELD ARTILLERY

155mm Howitzer

Training Management Considerations	AIT		NCO		OFF Basic	Unit Training
	13A10	13E20	Basic	Advance		
Prescribed Inst/Stu. Ratio	1/10	1/10	1/25* 1/12**	1/25* 1/12**	1/25* 1/12**	
Time Period Over Which Instruction Is Scheduled	7 wks	7 wks	12 wks	13 wks	13 wks	
Total Hours Allocated For Course	280	280	490	523	649.8	
Hours For Training	48***		33.5	2.5	66	
Hours For Evaluation	3***		6.2	.3	2	

*Conference

**Field

***Instruction for 155mm How, 8 Inch How and 175 Gun is given together. In this study, it is all reflected in each section.

FA Btry, 105, 155, T & SP

<u>Mission</u>	<u>Approximate Rounds</u>	<u>Unit Elements Evaluated</u>
1. Emergency Mission	16	FO FB COMM
2. Area Adjustment, High Angle	16	FO FB FDC COMM
3. Area Adjustment, Low Angle	16	FO FB FDC COMM
4. Registration, Impact	24	FO Survey FB FDC COMM
5. Registration, HB	10	Survey FB FDC COMM
6. Defensive Target	12	FO FB FDC COMM
7. Met + VE	6	FDC FB COMM
8. Time on Target	12	FDC FB COMM
9. Illumination	16	FO FDC FB COMM
10. Battery Transfer	6	Survey FB FDC COMM

FA Bn, 105, 155, T & SP

<u>Mission</u>	<u>Approximate Rounds</u>	<u>Unit Elements Evaluated</u>
1. Registration, ea btry, quick & time	78	FB FDC FO COMM
2. Area Adjustment, Low Angle (6)	98	FB FDC FO COMM
3. Bn Mass, one btry adjust	28	FB FDC FO COMM
4. Emergency Mission	16	FB FO COMM
5. Area Adjustment, High Angle	16	FO FDC FB COMM
6. HB Registration	10	Survey FDC FB COMM
7. Illumination	20	FO FB FDC COMM
8. Restituted Target	6	S-2 FDC FB COMM Survey
9. Met + VE	6	FDC FB COMM

FA Bn, 105, 155, T & SP (Cont'd)

<u>Mission</u>	<u>Approximate Rounds</u>	<u>Unit Elements Evaluated</u>
10. Defensive Target	6	FO FB FDC COMM
11. H & I Targets (6)	12	FB FDC COMM
12. Radar (HB) Registration	10	FDC Survey FB COMM Radar
13. MPI Registration (Radar)	10	FDC Survey FB COMM Radar
14. Bn Transfer Target Area Base	18	FDC FB COMM Survey
15. Bn Time on Target	36	FDC FB COMM

FIELD ARTILLERY

175mm Gun

Instructional Method	Hours of Instruction For Each Level of Training					
	AIT		NCO		OFF	Unit
	13A10*	13E20	Basic**	Advance	Basic	Training
1. Lecture	1					
2. Conference	16		6.3	1		
3. Demonstration			.6			
4. Practical Exercise	27		9.7			
5. Peer Instruction						
6. Instructor Guidance and Critique With Small Group	4					
7. Individualized, Self-Paced						
8. Group Paced						
9. Self Study						
10. Guest Speaker						
11. Case Study						
12. Review:			.5			
13. Computer-Assisted Instruction						
14. Programmed Instruction						
15. Other: _____						
Total Hours of Instruction	48		17.1	1		

*Instruction for 155mm How, 8 Inch How and 175mm Gun is given together. In this study, it is all reflected in each section.

**Primarily for 13B section of class.

FIELD ARTILLERY

175mm Gun

Instructional Media	Course Objectives Achieved With Various Media (Hrs)					
	AIT		NCO		OFF	Unit
	13A10*	13E20	Basic	Advance	Basic	Training
1. Field Trips	8					
2. Training Devices						
3. Audio Tape Recordings						
4. Transparencies						
5. Filmstrips						
6. Still Pictures						
7. Printed Material						
8. Television			.1			
9. Motion Pictures						
10. Actual Equipment	39		10			
11. Instructor	1		7	1		
12. Other: _____ _____						
Totals	48		17.1	1		

*Instruction for 155mm How, 8 Inch How and 175mm Gun is given together. In this study, it is all reflected in each section.

FIELD ARTILLERY

175mm Gun

Practical Exercises	Amount of Practice					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
CREW DRILL						
Live Fire (Artillery Team)	3/D(1)					(2)
Simulated Fire						
Dry Fire						
INDIVIDUAL DRILL						
Live Fire						
Simulated Fire						
Dry Fire						

(1) /D - per demonstration

(2) See attached pages for ATT/ORIT ammunition support requirements for 175mm Gun Battery and Battalion.

FIELD ARTILLERY

175mm Gun

End of Course Proficiency Measurement	Percent of Total Evaluation					
	AIT		NCO		OFF Basic	Unit Training
	13A10	13E20	Basic	Advance		
1. Type of Measure						
a. Norm Referenced (curve)			87	100		
b. Crit. Ref. (go/ no go)			13			
2. Type of Evaluation						
a. Paper and Pencil Test			87	100		
b. Hands-On, Part Task			13			
c. Performance with Training Devices						
d. Crew Drill, Gun- ner's Test						
e. Integrated Test of Terminal Per- formance Require- ments)						
f. Other: _____						

FIELD ARTILLERY

175mm Gun

Training Management Considerations	AIT		NCO		OFF Basic	Unit Training
	13A10	13E20	Basic	Advance		
Prescribed Inst/Stu. Ratio	1/10	1/10	1/25* 1/12**	1/25* 1/12**	1/25* 1/12**	
Time Period Over Which Instruction Is Scheduled	7 wks	7 wks	12 wks	13 wks	13 wks	
Total Hours Allocated For Course	280	280	490	523	649.8	
Hours For Training	48***		17.1	1		
Hours For Evaluation			2	.1		

*Conference

**Field

***Instruction for 155mm How, 8 Inch How and 175mm Gun is given together. In this study, it is all reflected in each section.

FA Btry 175mm

<u>Mission</u>	<u>Approximate Rounds</u>	<u>Unit Elements Evaluated</u>
1. Area Adjustments	12	FO FDC FB COMM
2. Registration	12	FO FDC FB COMM
3. HB Registration		Survey FO FB FDC COMM
4. Defensive Target	4	FO FDC FB COMM
5. Interdiction Target	4	FDC FB COMM
6. HB Nuclear Simulated		FO Survey FDC FB COMM
7. Met + VE	4	FDC FB COMM
8. FFE	4	FDC
9. TOT	8	FB COMM

FA Bn, Gun, Heavy 175

<u>Mission</u>	<u>Approximate Rounds</u>	<u>Unit Elements Evaluated</u>
1. Registration, ea btry, quick	36	FB FDC FO COMM
2. Area Adjustments (4)	48	FB FDC FO COMM
3. Battalion Mass, one btry, adjust	20	FB FDC FO COMM
4. Six H & I Targets	6	FB FDC COMM
5. Counter Preparation Targets	12	FDC FB COMM
6. Met + VE	4	FDC FB COMM
7. Restituted Target	4	S-2 FDC FB COMM
8. On-Call Mission	4	FB FDC FO COMM
9. MPI Registration	10	FDC FB Survey COMM

FA Bn, Gun, Heavy 175 (Cont'd)

<u>Mission</u>	<u>Approximate Rounds</u>	<u>Unit Elements Evaluated</u>
10. Bn Transfer	12	Survey FDC FB COMM
11. Three Bn on-call missions	12	FO FDC FB COMM
12. Battalion TOT	24	FB FDC COMM

FIELD ARTILLERY

8 Inch Howitzer

Instructional Method	Hours of Instruction For Each Level of Training					Unit Training
	AIT		NCO		OFF Basic	
	13A10*	13E20	Basic**	Advance		
1. Lecture	1					
2. Conference	16		10.7	1	2.5	
3. Demonstration			1.5			
4. Practical Exercise	27		15.6	7.6		
5. Peer Instruction						
6. Instructor Guidance and Critique With Small Group	4					
7. Individualized, Self-Paced						
8. Group Paced						
9. Self Study						
10. Guest Speaker						
11. Case Study						
12. Review			.5			
13. Computer-Assisted Instruction						
14. Programmed Instruction						
15. Other: _____						
Total Hours of Instruction	48		28.3	1	10.1	

*Instruction for 155mm How, 8 Inch How and 175mm Gun is given together. In this study, it is all reflected in each section.

**Primarily for 13B section of class.

FIELD ARTILLERY

8 Inch Howitzer

Instructional Media	Course Objectives Achieved With Various Media					
	AIT		NCO		OFF Basic	Unit Training
	13A10*	13E20	Basic	Advance		
1. Field Trips	8					
2. Training Devices						
3. Audio Tape Recordings						
4. Transparencies						
5. Filmstrips						
6. Still Pictures						
7. Printed Material						
8. Television			.1			
9. Motion Pictures						
10. Actual Equipment	39		16		4.2	
11. Instructor	1		12.2	1	5.9	
12. Other: _____ _____						
Totals	48		28.3	1	10.1	

*Instruction for 155mm How, 8 Inch How and 175mm Gun is given together. In this study, it is all reflected in each section.

FIELD ARTILLERY

8 Inch Howitzer

Practical Exercises	Amount of Practice					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
CREW DRILL						
Live Fire (Artillery Team) (Crew)	6/D(1)		2.5/S (2) (3)			(4)
Simulated Fire						
Dry Fire						
INDIVIDUAL DRILL						
Live Fire (Gunner & Chief of Section)			2.5/S(3)			
Simulated Fire						
Dry Fire						

- (1) /D - per demonstration
 (2) /S - per student
 (3) Same rounds
 (4) See attached pages for ATT/ORTT ammunition support requirements for
 8 Inch How Battery and Battalion

FIELD ARTILLERY

8 Inch Howitzer

End of Course Proficiency Measurement	Percent of Total Evaluation					
	AIT		NCO		OFF	Unit
	13A10	13E20	Basic	Advance	Basic	Training
1. Type of Measure						
a. Norm Referenced (curve)			87	100	100	
b. Crit. Ref. (go/ no go)			13			100
2. Type of Evaluation						
a. Paper and Pencil Test			87	100	100	
b. Hands-On, Part Task			13			
c. Performance with Training Devices						
d. Crew Drill, Gun- ner's Test						
e. Integrated Test of Terminal Per- formance Require- ments)						
f. Other: _____						

FIELD ARTILLERY

8 Inch Howitzer

End of Course Proficiency Measurement	Test Trials or Rounds Per Trainee					Unit Training
	AIT		NCO		OFF	
	13A10	13E20	Basic	Advance	Basic	
Evaluation of Firing Proficiency						100%
Crew Performance						
Live Fire						
Simulated Fire						
Dry Fire						
Individual Perform- ance						
Live Fire						
Simulated Fire						
Dry Fire						

FIELD ARTILLERY

8 Inch Howitzer

Training Management Considerations	AIT		NCO		OFF	Unit Training
	13A10	13E20	Basic	Advance	Basic	
Prescribed Inst/Stu. Ratio	1/10	1/10	1/25* 1/12**	1/25* 1/12**	1/25* 1/12**	
Time Period Over Which Instruction Is Scheduled	7 wks	7 wks	12 wks	13 wks	13 wks	
Total Hours Allocated For Course	280	280	490	523	649.8	
Hours For Training	48***		28.3	1	10.1	
Hours For Evaluation			3	.1	1.9	

*Conference

**Field

***Instruction for 155mm How, 8 Inch How and 175mm Gun is given together. In this study, it is all reflected in each section.

FA Btry 8 Inch

<u>Mission</u>	<u>Approximate Rounds</u>	<u>Unit Elements Evaluated</u>
1. Area Adjustments	12	FO FDC FB COMM
2. Registration	22	FO FDC FB COMM
3. HB Registration	10	Survey FO FB FDC COMM
4. Defensive Target	4	FO FDC FB COMM
5. Interdiction Target	4	FDC FB COMM
6. HB Nuclear Simulated	3	FO Survey FDC FB COMM
7. Met + VE	4	FDC FB COMM
8. FFE	4	FDC
9. TOT	8	FB COMM

FA Bn, Howitzer, Heavy 8 Inch

<u>Mission</u>	<u>Approximate Rounds</u>	<u>Unit Elements Evaluated</u>
1. Registration, ea btry, quick & time	36 66	FB FDC FO COMM
2. Area Adjustments (4)	48 48	FB FDC FO COMM
3. Battalion Mass, one btry adjust	20	FB FDC FO COMM
4. Registration, High Burst	10	Survey FDC FB COMM
5. Six H & I Targets	6	FB FDC COMM
6. Two High Burst Registrations (Nuclear Simulated)	6	FDC FB FO Survey COMM
7. K Transfer (Nuclear Simulated)	2	FDC FB COMM
8. Counter Preparation	12	FDC FB COMM
9. Met + VE	4	FDC FB COMM

FA Bn, Howitzer, Heavy 8 Inch

<u>Mission</u>	<u>Approximate Rounds</u>	<u>Unit Elements Evaluated</u>
10. Restituted Target	4	S-2 FDC FB COMM
11. Met + VE (Nuclear Simulated)	1	FB FDC COMM
12. On-Call Mission	4	FB FDC FO COMM
13. MPI Registration	10	FDC FB Survey COMM
14. Bn Transfer	12	Survey FDC FB COMM
15. Battalion TOT	24	FB FDC COMM

FIELD ARTILLERY

Facilities & Fiscal Support Required	WEAPON SYSTEMS			
	105mm Howitzer	155mm Howitzer	8 Inch Howitzer	175mm Gun
WEAPON COST				
Initial	M101A1 \$21,254 M102 \$61,785	M114A1 \$30,618 M109 \$125,396	M110 \$154,324	M107 \$165,683
Weapon/ Barrel	M101A1 7500 M102 5000	M114A1 7500 M109 5000/7500	M110 7,500	M113 300 Zone 3 M113A1E1 1200
Life In Terms of Rounds				
Operating Costs Per Vehicle				
Based on 100 Operating Hrs or 1000 Miles Per Year & Does Not Include Main Ammunition Costs.				
Crew		M109 \$5,935	M110 \$5,320	M107 \$5,320
Parts		M109 \$11,430	M110 \$10,304	M107 \$10,304
Labor		M109 \$2,405	M110 \$2,442	M107 \$2,383
POL		M109 \$170	M110 \$253	M107 \$253

Facilities & Fiscal Support Required	WEAPON SYSTEMS			
	105mm Howitzer	155mm Howitzer	8 Inch Howitzer	175mm Gun
Depot Overhaul Costs Based on a Per Vehicle Need. Figures are Based on a Average but Only for Vehicles Needing Overhaul.				
Parts		M109 \$12,725	M110 \$40,995	M107 \$51,600
Labor		M109 \$32,748	M110 \$30,978	M107 \$30,978
Transportation		M109 \$278	M110 \$333	M107 \$347
Annual Operating Costs Per Weapon System (Personnel, Replacement Tng, Repair Parts, POL, Depot Maint.)	M102 \$74,629	M109 \$104,208	M110 \$138,940	M107 \$133,047
Ammunition Cost Per Round				
HE	M1 \$20.01	M107 \$30.84	M106 \$55.79	M437E2 \$73.98
HEAT	M344A1 \$57.10			
HEP-T	M327 \$30.80			
Smoke HC	M84 \$56.06	M116 \$60.40		
WP	M60 \$42.98	M110 \$46.34		
Illum.	\$44.34	M118 \$48.56		
Leaflet	M8 \$32.20			
TP-T	\$30.14			

Facilities & Fiscal Support Required	WEAPON SYSTEMS			
	105mm Howitzer	155mm Howitzer	8 Inch Howitzer	175mm Gun
Anti-Pers-T ICM	M494 \$511.00 M444 \$135.00	M449E1 \$145.00	M404 \$363.00 M424 \$1,853.00	
HE-Spotting Fuzes				
Proximity/VT	M513 \$45.00	M514 \$44.39	M514 \$44.39	
Point Detonating	M557 \$4.71	M557 \$4.71	M557 \$4.71	M572 \$4.99
MTSQ	M564 \$16.78	\$16.78	\$16.78	
Cartridge 14.5 w/ fuze M181 w/fuze M183	\$1.00 \$1.05			
Charges		M3 GB \$13.07	M1 GB \$12.48 M2 WB \$32.92	M86 \$80.88
Approximate Sizes of Ranges Required For Training				
Tactical Exercises (maneuvers)				
Battery	16 Km ² 100 Km ²	16 Km ² 100 Km ²	36 Km ² 121 Km ²	36 Km ² 121 Km ²
Minimum Desired				
Battalion	225 Km ² 289 Km ²	225 Km ² 289 Km ²	256 Km ² 324 Km ²	256 Km ² 324 Km ²
Minimum Desired				

Facilities & Fiscal Support Required	WEAPON SYSTEMS		
	105mm Howitzer	155mm Howitzer	8 Inch Howitzer
Gun Drills			175mm Gun
Battery	100x100 meters	100x100 meters	100x100 meters
Battalion	600x600 meters	600x600 meters	600x600 meters
Live Fire	As a minimum, the impact area should accommodate six weapons firing at 2,800 meters minimum and 8,000 meters maximum range with 600 mils deflection at minimum range.		
Number of Support Personnel Required For Live Firing	<ol style="list-style-type: none"> 1. Should have range operations section to control range entry and to keep unit from misuse of range. 2. Metro sections usually belong to parent artillery unit and derive training when they support a firing unit. 3. Ranges may be maintained by users or full-time range organization depending on size of post and number of units using range. 4. Medical support is normally organic to artillery unit. 		

FIELD ARTILLERY

FDC PROCEDURES

Instructional Method	Hours of Instruction For Each Level of Training					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic*	Advance		
1. Lecture		28.6				
2. Conference			26.8	32	24.9	
3. Demonstration		17.5	6.2	1	1.8	
4. Practical Exercise		98.9	58.2	15	99.9	
5. Peer Instruction		**				
6. Instructor Guidance and Critique With Small Group						
7. Individualized, Self-Paced						
8. Group Paced						
9. Self Study						
10. Guest Speaker						
11. Case Study						
12. Seminar						
13. Computer-Assisted Instruction						
14. Programmed Instruction						
15. Other: _____						
Total Hours of Instruction		145	91.2	48	126.6	

*Primarily for 13E section of class.

**Takes place during all training.

FIELD ARTILLERY

FDC PROCEDURES

Instructional Media	Course Objectives Achieved With Various Media (Hrs)					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
1. Field Trips		22	18.1	10		
2. Training Devices						
3. Audio Tape Recordings						
4. Transparencies						
5. Filmstrips						
6. Still Pictures						
7. Printed Material						
8. Television						
9. Motion Pictures		2.5				
10. Actual Equipment		98.9	58.2	15	100	
11. Instructor		21.6	14.9	23	26.6	
12. Other: _____						
Totals		145	91.2	48	126.6	

FIELD ARTILLERY

FDC PROCEDURES

Practical Exercises	Amount of Practice					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
CREW DRILL						
Live Fire FDC Team		11/S (1) (2)			(4) 2.4/S	(5)
Simulated Fire						
Dry Fire						
INDIVIDUAL DRILL						
Live Fire Chronograph & Computer Registrations Cor. Met & VE Corrections VE Corrections Registration		11/S(2)	2.7/S(3) 2/S(3)	2/S 2.5/S	2/S 2.5/S	
Simulated Fire						
Dry Fire						

(1) /S - per student

(2) Same rounds

(3) 13E training only and 2 are same rounds

(4) Rounds reflected in FA Bn in Combat and Artillery Team 105mm
How table also used for FDC training

(5) See appropriate Cannon Section for ATT/ORTT support requirements

FIELD ARTILLERY

FDC PROCEDURES

End of Course Proficiency Measurement	Percent of Total Evaluation					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
1. Type of Measure						
a. Norm Referenced (curve)			40			
b. Crit. Ref. (go/ no go)		100	60	100	100	
2. Type of Evaluation						
a. Paper and Pencil Test			40	100	75	
b. Hands-On, Part Task		100	60		25	
c. Performance with Training Devices						
d. Crew Drill, Gun- ner's Test						
e. Integrated Test of Terminal Per- formance Require- ments)						
f. Other: _____ _____ _____						

FIELD ARTILLERY

FDC PROCEDURES

End of Course Proficiency Measurement	Test Trials or Rounds Per Trainee					
	AIT		NCO		OFF Basic	Unit Training
	13A10	13E20	Basic	Advance		
Evaluation of Firing Proficiency						
Crew Performance						
Live Fire						
Simulated Fire						
Dry Fire						
Individual Perform- ance						
Live Fire						
Simulated Fire						
Dry Fire		100%				

FIELD ARTILLERY

FDC PROCEDURES

Training Management Considerations	AIT		NCO		OFF	Unit Training
	13A10	13E20	Basic	Advance	Basic	
Prescribed Inst/Stu. Ratio	1/10	1/10	1/25* 1/12**	1/25* 1/12**	1/25* 1/12**	
Time Period Over Which Instruction Is Scheduled	7 wks	7 wks	12 wks	13 wks	13 wks	
Total Hours Allocated For Course	280	280	490	523	649.8	
Hours For Training		145	91.2	48	126.6	
Hours For Evaluation		17	2.5	2	15	

*Conference

**Field

FIELD ARTILLERY

OBSERVED FIRE

Instructional Method	Hours of Instruction For Each Level of Training					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
1. Lecture		2.5				
2. Conference			4.2	6	4.6	
3. Demonstration		2		7		
4. Practical Exercise		11	4.2	8.4	62.7	
5. Peer Instruction						
6. Instructor Guidance and Critique With Small Group						
7. Individualized, Self-Paced						
8. Group Paced						
9. Self Study						
10. Guest Speaker						
11. Case Study						
12. Seminar						
13. Computer-Assisted Instruction						
14. Programmed Instruction						
15. Other: _____						
Total Hours of Instruction		15.5	8.4	21.4	67.3	

FIELD ARTILLERY

OBSERVED FIRE

Instructional Media	Course Objectives Achieved With Various Media (Hrs)					Unit Training
	AIT		NCO		OFF	
	13A10	13E20	Basic	Advance	Basic	
1. Field Trips		8			50	
2. Training Devices			4.2		4.2	
3. Audio Tape Recordings						
4. Transparencies						
5. Filmstrips						
6. Still Pictures						
7. Printed Material						
8. Television					1.2	
9. Motion Pictures						
10. Actual Equipment						
11. Instructor		7.5	4.2	6	11.9	
12. Other: _____ _____						
Totals		15.5	8.4	21.4	67.3	

FIELD ARTILLERY

OBSERVED FIRE

Practical Exercises	Amount of Practice					Unit Training
	AIT		NCO		OFF Basic	
	13A10	13E20	Basic	Advance		
CREW DRILL						(5)
Live Fire						
Simulated Fire						
Dry Fire						
INDIVIDUAL DRILL						
Live Fire (Observed Fire)		14/S (1) (3)			39/S (4) 124, RKT/P	
Simulated Fire (Observed Fire)			12,14.5 /S		250, 14.5/P (2) 11, 14.5/S	
Dry Fire						

(1) /S - per student

(2) /P - per practical exercise

(3) 11 rounds same as in FDC Table

(4) Rounds reflected in FA Bn in Combat and Artillery Team 105mm
How table also used for observed fire training

(5) See appropriate Cannon Section for ATT/ORTT support requirements

FIELD ARTILLERY

OBSERVED FIRE

End of Course Proficiency Measurement	Percent of Total Evaluation					
	AIT		NCO		OFF Basic	Unit Training
	13A10	13E20	Basic	Advance		
1. Type of Measure						
a. Norm Referenced (curve)						
b. Crit. Ref. (go/ no go)					100	
2. Type of Evaluation						
a. Paper and Pencil Test						
b. Hands-On, Part Task						
c. Performance with Training Devices						
d. Crew Drill, Gun- ner's Test						
e. Integrated Test of Terminal Per- formance Require- ments)					100	
f. Other: _____						

FIELD ARTILLERY

OBSERVED FIRE

End of Course Proficiency Measurement	Test Trials or Rounds Per Trainee					
	AIT		NCO		OFF	Unit
	13A10	13E20	Basic	Advance	Basic	Training
Evaluation of Firing Proficiency						
Crew Performance						
Live Fire						
Simulated Fire						
Dry Fire						
Individual Perform- ance						
Live Fire						
Simulated Fire						
Dry Fire					100%	

FIELD ARTILLERY

OBSERVED FIRE

Training Management Considerations .	AIT		NCO		OFF	Unit Training
	13A10	13E20	Basic	Advance	Basic	
Prescribed Inst/Stu. Ratio	1/10	1/10	1/25* 1/12**	1/25* 1/12**	1/25* 1/12**	
Time Period Over Which Instruction Is Scheduled	7 wks	7 wks	12 wks	13 wks	13 wks	
Total Hours Allocated For Course	280	280	490	523	649.8	
Hours For Training		15.5	8.4	21.4	67.3	
Hours For Evaluation				1	.9	

*Conference

**Field

FIELD ARTILLERY

HONEST JOHN

Instructional Method	Hours of Instruction For Each Level of Training			
	AIT	BASIC NCO	ADVANCE NCO	OFFICERS NCO
1. Lecture	2			
2. Conference	26	23.3	18.9	24.0
3. Demonstration	11		.9	
4. Practical Exercise	58	41.6	4.2	18.3
5. Peer Instruction				
6. Instructor Guidance and Critique With Small Group	5		12.8	
7. Individualized, Self-Paced				
8. Group Paced				
9. Self Study				
10. Guest Speaker				
11. Case Study				
12. Seminar				
13. Computer-Assisted Instruction				
14. Programmed Instruc- tion				
15. Other: _____ _____				
Total Hours of Instruction	102	64.9	36.8	42.7

FIELD ARTILLERY

HONEST JOHN

Instructional Media	Course Objectives Achieved With Various Media (Hrs)			
	AIT	BASIC NCO	ADVANCE NCO	OFFICERS COURSE
1. Field Trips	20.5			
2. Training Devices	*	.9	0	5
3. Audio Tape Recordings				
4. Transparencies	1			
5. Filmstrips				
6. Still Pictures				
7. Printed Material	1			
8. Television	5	3.8	.8	3.4
9. Motion Pictures				
10. Actual Equipment	41	41.6	4.2	18.3
11. Instructor	33.5	18.6	31.8	15.5
12. Other: _____ _____				
Totals	102	64.9	36.8	42.7

*All training is conducted in conjunction with training devices.

FIELD ARTILLERY

HONEST JOHN

Practical Exercises	Amount of Practice (hrs)			
	AIT	BASIC NCO	ADVANCE NCO	OFFICER COURSE
CREW DRILL				
Live Fire*				
Simulated Fire**		41.0	41.0	41.0
Dry Fire				
INDIVIDUAL DRILL				
Live Fire				
Simulated Fire				
Dry Fire				

*It is desired that one (1) round be available for each crew to be fired by the AIT soldier in their final phases of training. To date, this goal has not been met. The unit is allocated from 5 to 6 live rounds per crew. The unit trains from 7 to 20 cycles per year.

**Training is conducted using entire crew during 50 hours of training exercises. The training utilizes "round robin" approach to practicing target destruction.

FIELD ARTILLERY

HONEST JOHN

End of Course Proficiency Measurement	Percent of Total Evaluation				
	AIT	BASIC NCO	ADVANCE NCO	OFFICER COURSE	ATT/ ORTT
1. Type of Measure					
a. Norm Referenced (curve)	6	100	100	0	
b. Crit. Ref. (go/ no go)	94			0	100
2. Type of Evaluation					
a. Paper and Pencil Test	6	100	100		
b. Hands-On, Part Task	94				
c. Performance with Training Devices					
d. Crew Drill, Gun- ner's Test					
e. Integrated Test of Terminal Per- formance Require- ments)					100
f. Other: _____ _____ _____					

FIELD ARTILLERY

HONEST JOHN

End of Course Proficiency Measurement	Test Trials or Rounds Per Trainee (Hrs)				
	AIT	BASIC NCO	ADVANCE NCO	OFFICER COURSE	AIT/ ORTT
Evaluation of Firing Proficiency					
Crew Performance					
Live Fire					
Simulated Fire (Intire Crew)*		41.6	4.2		100% 3 Practice Rds/WPN
Dry Fire					
Individual Performance					
Live Fire					
Simulated Fire (Continuous)**					
Dry Fire					

*Entire crew is evaluated according to proficiency and timeliness during competition or practice fire missions. Deficiencies are identified and corrected through critique.

**Evaluation of individual performance is continually monitored during crew drills as individual changes duties.

FIELD ARTILLERY

HONEST JOHN

Training Management Considerations	AIT	BASIC NCO	ADVANCE NCO	OFFICER COURSE
Prescribed Inst/Stu. Ratio	*			
Time Period Over Which Instruction Is Scheduled	5 wks 3 dys	11 wks 1 day	13 wks	1 wk 2 dys
Total Hours Allocated For Course	280	458	523	86
Hours For Training	102	64.9	36.8	42.7
Hours For Evaluation	17	6	1.7	

*Currently, the unit is authorized 36 instructors. Instructors are divided into sections, each section training one AIT cycle. The instructor/student ratio depends upon the input of the cycle which has ranged from 15 students to 40 students. A ratio of 1 instructor per 5 students is desired.

FIELD ARTILLERY

LANCE

Instruction Method	Hours of Instruction Per Week			Total
	ACT	BASIC NGO	ADVANCED NGO	
1. Lectures	18			
2. Demonstrations	8	91.1		
3. Demonstrations	1	3.9	0.1	
4. Practical Exercises	100	96.7	118.6	
5. Post Instruction				
6. Instructor Guidance General Group with Junior Group		21.9		
7. Individually Self-Paced				
8. Group Paced				
9. Self-Study				
10. Guest Speaker				
11. Self-Study				
12. Self-Study				
13. Computer Assisted Self-Study				
14. Prescheduled Activities Case				
15. Self-Study				
16. Self-Study				
17. Self-Study				
18. Self-Study				
19. Self-Study				
20. Self-Study				
21. Self-Study				
22. Self-Study				
23. Self-Study				
24. Self-Study				
25. Self-Study				
26. Self-Study				
27. Self-Study				
28. Self-Study				
29. Self-Study				
30. Self-Study				
31. Self-Study				
32. Self-Study				
33. Self-Study				
34. Self-Study				
35. Self-Study				
36. Self-Study				
37. Self-Study				
38. Self-Study				
39. Self-Study				
40. Self-Study				
41. Self-Study				
42. Self-Study				
43. Self-Study				
44. Self-Study				
45. Self-Study				
46. Self-Study				
47. Self-Study				
48. Self-Study				
49. Self-Study				
50. Self-Study				
51. Self-Study				
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53. Self-Study				
54. Self-Study				
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56. Self-Study				
57. Self-Study				
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64. Self-Study				
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67. Self-Study				
68. Self-Study				
69. Self-Study				
70. Self-Study				
71. Self-Study				
72. Self-Study				
73. Self-Study				
74. Self-Study				
75. Self-Study				
76. Self-Study				
77. Self-Study				
78. Self-Study				
79. Self-Study				
80. Self-Study				
81. Self-Study				
82. Self-Study				
83. Self-Study				
84. Self-Study				
85. Self-Study				
86. Self-Study				
87. Self-Study				
88. Self-Study				
89. Self-Study				
90. Self-Study				
91. Self-Study				
92. Self-Study				
93. Self-Study				
94. Self-Study				
95. Self-Study				
96. Self-Study				
97. Self-Study				
98. Self-Study				
99. Self-Study				
100. Self-Study				

FIELD ARTILLERY

HONEST JOHN

Training Management Considerations	AIT	BASIC NCO	ADVANCE NCO	OFFICER COURSE
Prescribed Inst/Stu. Ratio	*			
Time Period Over Which Instruction Is Scheduled	5 wks 3 dys	11 wks 1 day	13 wks	1 wk 2 dy.
Total Hours Allocated For Course	280	458	523	86
Hours For Training	102	64.9	36.8	42.7
Hours For Evaluation	17	6	1.7	

*Currently, the unit is authorized 36 instructors. Instructors are divided into sections, each section training one AIT cycle. The instructor/student ratio depends upon the input of the cycle which has ranged from 15 students to 40 students. A ratio of 1 instructor per 5 students is desired.

FIELD ARTILLERY

LANCE

Instructional Media	Course Objectives Achieved With Various Media (Hrs)			
	AIT	BASIC NCO	LANCE CADRE	ADV NCO
1. Field Trips	9			
2. Training Devices	*		48.8	3.4
3. Audio Tape Recordings				
4. Transparencies	15			
5. Filmstrips				
6. Still Pictures				
7. Printed Material				
8. Television			0.9	
9. Motion Pictures				
10. Actual Equipment	180	96.7	96.7	6.8
11. Instructor		62.9	3.2	7.9
12. Other: _____ _____				
Totals	204	159.6	159.6	18.1

*All training is conducted in conjunction with training devices.

FIELD ARTILLERY

LANCE

Practical Exercises	Amount of Practice (Hrs)			
	AIT	BASIC NCO	LANCE CAPRE	ADV NCO
CREW DRILL				
Live Fire				
Simulated Fire		96.7	96.7	
Dry Fire				
INDIVIDUAL DRILL				
Live Fire				
Simulated Fire				
Dry Fire				

FIELD ARTILLERY

LANCE

End of Course Proficiency Measurement	Percent of Total Evaluation					
	AIT	BASIC NCO	LANCE CADRE	ADV NCO	Unit Training	
					ATT	ORTT
1. Type of Measure						
a. Norm Referenced (curve)		100	100	100		
b. Crit. Ref. (go/ no go)	100				100	100
2. Type of Evaluation						
a. Paper and Pencil Test		100	100	100		
b. Hands-On, Part Task	50					
c. Performance with Training Devices	50					
d. Crew Drill, Gun- ner's Test						
e. Integrated Test of Terminal Per- formance Require- ments)					100	100
f. Other: _____ _____ _____						

FIELD ARTILLERY

LANCE

End of Course Proficiency Measurement	Test Trials or Rounds Per Trainee (1919)				
	AIT	BASIC NCO	LANCE CADRE	ADV NCO	ATI/ORTT
Evaluation of Firing Proficiency					
Crew Performance					
Live Fire					minimum train- ing round per crew.
Simulated Fire		96.7	96.7		
Dry Fire					
Individual Perform- ance					
Live Fire					
Simulated Fire					
Dry Fire					

FIELD ARTILLERY

LANCE

Training Management Considerations	AIT	BASIC NCO	LANCE CADRE	ADV NCO
Prescribed Inst/Stu. Ratio	1:3			
Time Period Over Which Instruction Is Scheduled	7 wks	10 wks 4 dys	7 wks	
Total Hours Allocated For Course	216	432.0	293.8	523
Hours For Training	204	159.6	159.6	18.1
Hours For Evaluation	12	14.2	14.2	.9

FIELD ARTILLERY

SERGEANT

Instructional Method	Hours of Instruction For Each Level of Training				
	AIT	SGT Missile Battery	BASIC NCO	ADVANCE NCO	SGT OFFICER
1. Lecture	5				
2. Conference	26	32.5	29.8	5.4	32.4
3. Demonstration	3½	4.0	.9	4.4	2.7
4. Practical Exercise	126½	72.5	32.6		43.9
5. Peer Instruction					
6. Instructor Guidance and Critique With Small Group					
7. Individualized, Self-Paced					
8. Group Paced					
9. Self Study					
10. Guest Speaker					
11. Case Study					
12. Seminar					
13. Computer-Assisted Instruction					
14. Programmed Instruction		6.0	1.7		
15. Other: <u>Not weapons training</u>					11.7
Total Hours of Instruction	161	115	65	9.8	90.7

FIELD ARTILLERY

SERGEANT

Instructional Media	Course Objectives Achieved With Various Media (Hrs)				
	AIT	SGT Missile Battery	BASIC NCO	ADVANCE NCO	SGT OFFICER
1. Field Trips	12				
2. Training Devices	*	16.2	6.9	4.4	19.5
3. Audio Tape Recordings					
4. Transparencies	12				
5. Filmstrips					
6. Still Pictures					
7. Printed Material					
8. Television		.5	1.3		1.4
9. Motion Pictures					
10. Actual Equipment	78	72.5	32.6	4.4	43.9
11. Instructor	59	25.8	24.2	1	35.9
12. Other: _____ _____					
Totals	161	115	65	9.8	90.7

*All training is conducted in conjunction with training devices.

FIELD ARTILLERY

SERGEANT

Practical Exercises	Amount of Practice (Hrs)				
	AIT	SGT Missile Battery	BASIC NCO	ADVANCED NCO	SGT OFFICER
CREW DRILL					
Live Fire					
Simulated Fire	12	72.5	32.6		43.9
Dry Fire					
INDIVIDUAL DRILL					
Live Fire					
Simulated Fire					
Dry Fire	105.4				

FIELD ARTILLERY

SERGEANT

End of Course Proficiency Measurement	Percent of Total Evaluation					
	AIT	SGT Missile Battery	BASIC NCO	ADV NCO	OFFICER	ATT/ORTT
1. Type of Measure						
a. Norm Referenced (curve)		100	100		100	
b. Crit. Ref. (go/ no go)	100					100
2. Type of Evaluation						
a. Paper and Pencil Test		56	100		100	
b. Hands-On, Part Task	84.2	44				
c. Performance with Training Devices	15.8					
d. Crew Drill, Gun- ner's Test						
e. Integrated Test of Terminal Per- formance Require- ments)						100
f. Other: _____						

FIELD ARTILLERY

SERGEANT

End of Course Proficiency Measurement	Test Trials or Rounds Per Trainee (Hrs)					
	AIT	SGT Missile Battery	BASIC NCO	ADV NCO	SGT OFFICER	ATT/ORTT
Evaluation of Firing Proficiency						
Crew Performance						
Live Fire						
Simulated Fire		72.5	32.6	43.9		100% 1 Practice rd/WPN
Dry Fire						
Individual Perform- ance						
Live Fire						
Simulated Fire	19	7				
Dry Fire						

FIELD ARTILLERY

SERGEANT

Training Management Considerations	AIT	SGT Missile Battery	BASIC NCO	ADV NCO	SGT OFFICER
Prescribed Inst/Stu. Ratio					
Time Period Over Which Instruction Is Scheduled	7 wks	5 wks	11 wks 2 dys	13 wks	3 wks 4 dys
Total Hours Allocated For Course	280	200	466	523	169.6
Hours For Training	161	115	65	9.8	90.7
Hours For Evaluation	19	16	10.3		16.8

FIELD ARTILLERY

PERSHING

Instructional Method	Hours of Instruction For Each Level of Training						
	AIT	PSMC*	PLSC**	BASIC NCO	PERSHING NCO	ADV. NCO	OFFICER
1. Lecture	9						
2. Conference		104.9	7.4	26.7	37.9	9.4	34.1
3. Demonstration	9	10.7		1.7	0.9	3.5	3.5
4. Practical Exercise	180	233.9	48.5	55.6	119.4	0.9	98.3
5. Peer Instruction	90***						
6. Instructor Guidance and Critique With Small Group							
7. Individualized, Self-Paced							
8. Group Paced							
9. Self Study							
10. Guest Speaker							
11. Case Study							
12. Seminar							
13. Computer-Assisted Instruction							
14. Programmed Instruc- tion		4.3	2.5	4.3	8.7		
15. Other: _____ _____							
Total Hours of Instruction	198	353.8	58.4	88.3	166.9	13.8	135.9

*PSMC - Pershing System Maintenance Course

**PLSC - Pershing Laying Specialist Course

***PE is incorporated into Peer Instruction

FIELD ARTILLERY

PERSHING

Instructional Media	Course Objectives Achieved With Various Media (Hrs)						
	AIT	PSMC	PLSC	BASIC NCO	PERSHING NCO	ADV. NCO	OFFICER
1. Field Trips							
2. Training Devices	*	24.7	2.5	4.9	3.4	3.5	9.6
3. Audio Tape Recordings							
4. Transparencies							
5. Filmstrips							
6. Still Pictures							
7. Printed Material							
8. Television	6	6.3	0.5	0.9	5.3	1.2	5.6
9. Motion Pictures							
10. Actual Equipment	160	211.9	58.5	55.6	119.9	4.9	98.3
11. Instructor	52	88.9	6.9	26.9	38.8	4.7	20.9
12. Other: Obs. of Fact.	8						
Units in Operation							
Totals	198	353.8	58.9	88.3	166.9	14.8	145.9

*All training is conducted in conjunction with training devices.

FIELD ARTILLERY

PERSHING

Practical Exercises	Amount of Practice (Hrs)						
	AIT	PSMC	PLSC	BASIC NCO	PERSHING NCO	ADV. NCO	OFFICER
CREW DRILL							
Live Fire							
Simulated Fire	54	233.9	48.5	55.6	119.4	0.9	98.3
Dry Fire							
INDIVIDUAL DRILL							
Live Fire							
Simulated Fire							
Dry Fire							

FIELD ARTILLERY

PERSHING

End of Course Proficiency Measurement	Percent of Total Evaluation								
	AIT	PSMC	PLSC	BASIC NCO	PER NCO	ADV NCO	OFF	Unit Training	
								ATT*	ORTT**
1. Type of Measure									
a. Norm Referenced (curve)		43	29	100	58	100	100		
b. Crit. Ref. (go/ no go)	100	57	71		42			100+	100++
2. Type of Evaluation									
a. Paper and Pencil Test		43	29	100	58	100	100		
b. Hands-On, Part Task		57	71		42				
c. Performance with Training Devices									
d. Crew Drill, Gun- ner's Test									
e. Integrated Test of Terminal Per- formance Require- ments)								100	100
f. Other: <u>Perform-</u> <u>ance with equip-</u> <u>ment and train-</u> <u>ing devices</u>	100								

*ATT - Army Training Test

**ORTT - Operational Readiness Training Test

+Excellent, Satisfactory, Unsatisfactory

++Combat Ready, Not Combat Ready

FIELD ARTILLERY

PERSHING

End of Course Proficiency Measurement	Test Trials or Rounds Per Trainee (Hrs)							
	AIT	PSMC	PLSC	BASIC NCO	PER NCO	ADV NCO	OFF	ORTT/ATT
Evaluation of Firing Proficiency								
Crew Performance								
Live Fire								
Simulated Fire	4	233.9	48.5	55.6	119.4	0.9	98.3	100%* 1 Practice rd/btry
Dry Fire								
Individual Perform- ance								
Live Fire								
Simulated Fire	20							
Dry Fire								

*The overall adjectival rating will be determined by the chief umpire based upon the narrative reports of subordinate umpires. Narrative reports will highlight the strong and weak points of the tested unit and will include such matters as the validity of unit procedures, soundness and effectiveness of unit SOP, and the levels of performance of specific functions and missions. Any procedural violation that could result in a failure to deliver a reliable missile on target will be cause for a rating of unsatisfactory for that mission. Any failure or questionable launch will result in that mission being fired by another unit. Failure to meet a TOT due to other than equipment malfunction or improper maintenance procedures in the case of a malfunction, will be cause for a mission to be rated unsatisfactory. An unsatisfactory rating in any area will preclude an overall award of excellent. An overall rating of unsatisfactory will result when the unit is given an unsatisfactory rating in any one of the areas in Column 1 or in three of the areas in Column 2, listed below.

(a) Column 1.

1. Tactics
2. Communication.
3. Operations and firing.
4. Survey.

(b) Column 2.

1. CBR defense.
2. Military intelligence.
3. Code of conduct.
4. Organizational maintenance.

FIELD ARTILLERY

PERSHING

Training Management Considerations	AIT	PSMC	PLSC	BASIC NCO	PER NCO	ADV NCO	OFFICER
Prescribed Inst/Stu. Ratio	1:2						
Time Period Over Which Instruction Is Scheduled	7 wks	15 wks	2 wks 1 day		6 wks 2 dys	13 wks	6 wks
Total Hours Allocated For Course	280	596.3	83.2		252.5	523	259
Hours For Training	198	353.8	58.4	88.3	166.9	13.8	135.9
Hours For Evaluation	20	72.3	14.3	8.5	23.6	.9	21.9

FIELD ARTILLERY

Facilities & Fiscal Support Required	LANCE	SERGEANT	HONEST JOHN	PERSHING
WEAPON COST				
Initial	Launcher XM752 \$180,000 Trng ST 3,090	Launcher M504 \$1,418,901 Test STA GM 820,730 GEN ST 1,388 SEMITRI 41,645 TRNG SET 159,435	Launcher M386 \$156,560 Unit M405 \$29,940 Unit M78A1 \$15,697 Windset AN/PMQ-6 \$2,491	Launcher XM790 \$291,268 Wrecker M543 21,860 Proc TS GM 951,843 PWR STAT GM 407,882 MSL TNG XM61 509,115
Weapon/ Barrel Life	N/A	N/A	N/A	N/A
AMMUNITION				
Cost per Proponent	Guided Missile Main Assemblage \$80,000 Control Surface Small XM30 \$1,413 Control Surface Large XM29 \$3,413	Warhead Practice M65 \$7,482 Control Surface Assembly M94 \$8,260 RKT Motor \$54,400	RKT Motor Training M84 \$4,900 Warhead Section Practice M38 \$4,039 Inert Round \$38,000	Guidance Section 10398851 \$454,701 Propulsion Section 1st Stage XM101 \$130,390 Propulsion Section 2nd Stage 10398876 \$141,236
SIZE OF RANGE RE- QUIRED FOR:				
Tactical Exercise				
Battery				
Bn	324 Km ²	324 Km ²	Minimum 36 Km ² Desired 121 Km ²	324 Km ²
Gun	1200x1200 meters	1200x1200 meters	Minimum 324 Km ² Desired 441 Km ²	1200x1200 meters
Drills				
Live	No data available	In accordance with AR 385-62	Impact area 24x3 Km	In accordance with AR 385-62
Firing				
SUPPORT RE- QUIRED FOR LIVE FIRING	See Facility and Fiscal Support Table For Cannon Artillery			

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE 105mm, 155mm, 175mm & 8 inch

Level of Training	OBC
Title and Nomenclature of Training Device	14.5 Trainer M31
Description of Training Device	Sub-caliber device, can be mounted in tube of howitzer or mounted on tripod, fires a 14.5mm projectile giving off a puff of smoke, used for OF, FB and FDC training. (Training is applicable to all artillery weapons.)
Course of Instruction Utilizing Training Device	
Title	FAOBC
Total Number of Hours	8.4
Number of Instructional Hours Scheduled for Training Device	5.6
Total Amount of Time Each Trainee Uses Device	1.7
Phase, Period, or Block of Course Where Device is Used	First of Shoot
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	FB training OF training FDC training FADAC training

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>18%</p> <p>82%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>\$1,000 (approx)</p> <p>6</p> <p></p> <p></p> <p>\$1.00</p>

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE

Honest John

Level of Training	AIT
Title and Nomenclature of Training Device	Honest John Rocket M31 and M50 with associated equipment
Description of Training Device	Training is accomplished using inert practice rocket motor, and war-head. Everything else used in training is actual equipment used in live firing
Course of Instruction Utilizing Training Device	
Title	FA Rocket Crewman 15F10
Total Number of Hours	280
Number of Instructional Hours Scheduled for Training Device	102
Total Amount of Time Each Trainee Uses Device	102
Phase, Period, or Block of Course Where Device is Used	entire course
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Rocket assembly Electrical Checkout Arming Disarming Firing Procedures

Percentage of Total Firing Practice for the Weapon Conducted with the Following: Training Device Live Firing Dry Firing Other	100%
Training Device Costs Cost of Each Device Number of Devices Required per Course Expected Life of Device Maintenance Costs Per Year Cost Per Round (Where Appropriate)	\$227,786 2 \$ 38,000

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE Lance

Level of Training	AIT
Title and Nomenclature of Training Device	GM, Main assemblage, Training, M6
Description of Training Device	An inert training missile, containing simulated propellants and no pyrotechnic devices.
Course of Instruction Utilizing Training Device	
Title	15D10
Total Number of Hours	204
Number of Instructional Hours Scheduled for Training Device	110
Total Amount of Time Each Trainee Uses Device	110
Phase, Period, or Block of Course Where Device is Used	
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Each individual is learning every crewman's job in a lance crew.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE Lance

Level of Training	AIT
Title and Nomenclature of Training Device	M33 Control surfaces
Description of Training Device	Control surfaces (fins) for lance missile.
Course of Instruction Utilizing Training Device	
Title	15D10
Total Number of Hours	204
Number of Instructional Hours Scheduled for Training Device	110
Total Amount of Time Each Trainee Uses Device	110
Phase, Period, or Block of Course Where Device is Used	
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Used in conjunction with learning lance crew drills.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE Lance

Level of Training	AIT
Title and Nomenclature of Training Device	Warheads, Type 2, M201
Description of Training Device	Simulated high explosive warhead for lance.
Course of Instruction Utilizing Training Device	
Title	15D10
Total Number of Hours	204
Number of Instructional Hours Scheduled for Training Device	110
Total Amount of Time Each Trainee Uses Device	110
Phase, Period, or Block of Course Where Device is Used	
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Used in mating/demating operations and fire missions.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE
SGT Missile

Level of Training	AIT
Title and Nomenclature of Training Device	SGT Missile Training Device 3GS2
Description of Training Device	SGT Missile Training Set
<p>Course of Instruction Utilizing Training Device</p> <p>Title</p> <p>Total Number of Hours</p> <p>Number of Instructional Hours Scheduled for Training Device</p> <p>Total Amount of Time Each Trainee Uses Device</p> <p>Phase, Period, or Block of Course Where Device is Used</p>	<p>SGT Missile Crewman 15B10</p> <p>142</p> <p>94</p> <p>55 (Pract)</p> <p>55 hrs of 142 hrs</p>
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Learns mating, and firing procedures

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>4</p>

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE SGT Missile

Level of Training	AIT
Title and Nomenclature of Training Device	SGT Missile Firing Set. Training Device 3G100
Description of Training Device	Mockup of Firing Set on M504 Launching Station
Course of Instruction Utilizing Training Device	
Title	SGT Missile Crewman 15B10
Total Number of Hours	142
Number of Instructional Hours Scheduled for Training Device	8
Total Amount of Time Each Trainee Uses Device	8
Phase, Period, or Block of Course Where Device is Used	8 hrs of 142 hrs
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Operational Training of Firing Set Procedures

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE SGT Missile

Level of Training	AIT
Title and Nomenclature of Training Device	SGT Missile OMTS Training Device 3G100
Description of Training Device	Mockup of Organizational Maintenance Test
Course of Instruction Utilizing Training Device Title Total Number of Hours Number of Instructional Hours Scheduled for Training Device Total Amount of Time Each Trainee Uses Device Phase, Period, or Block of Course Where Device is Used	SGT Missile Crewman 15B10 142 20 20 20 hrs of 142 hrs
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Operational Training of OMTS Procedures

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE
SGT Missile

Level of Training	AIT
Title and Nomenclature of Training Device	SGT Missile Guidance Section Training Device 3G100
Description of Training Device	Mockup of Missile Guidance Section
Course of Instruction Utilizing Training Device	
Title	SGT Missile Crewman 15B10
Total Number of Hours	142
Number of Instructional Hours Scheduled for Training Device	20
Total Amount of Time Each Trainee Uses Device	20
Phase, Period, or Block of Course Where Device is Used	20 hrs of 142 hrs
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Test & Checkout procedures of Guidance Section

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>2</p>

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE SGT missile

Level of Training	AIT
Title and Nomenclature of Training Device	SGT Missile Rocket Motor & Initiator Assembly
Description of Training Device	Mockup of SGT Missile Rocket Motor and Initiator Assembly
Course of Instruction Utilizing Training Device	
Title	SGT Missile Crewman 15B10
Total Number of Hours	142
Number of Instructional Hours Scheduled for Training Device	1
Total Amount of Time Each Trainee Uses Device	1
Phase, Period, or Block of Course Where Device is Used	1 hr of 142 hrs.
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Learns installation of initiator device Learns how to check Rocket Motor Thermometers

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE Pershing

Level of Training	AIT
Title and Nomenclature of Training Device	Missile (Trainer, Hayes) XM61
Description of Training Device	Missile has same physical characteristics as tactical round. Trainer has no electrical capabilities. Trainer is presently used for assembly and disassembly operations.
Course of Instruction Utilizing Training Device	
Title	Missile Assembly & Firing Battery Operations
Total Number of Hours	MA - 67 / FBO - 54-121
Number of Instructional Hours Scheduled for Training Device	121
Total Amount of Time Each Trainee Uses Device	121
Phase, Period, or Block of Course Where Device is Used	
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Simulated firings Recapture techniques Assembly of missile Firing battery operations

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>\$509,115</p> <p>2</p>

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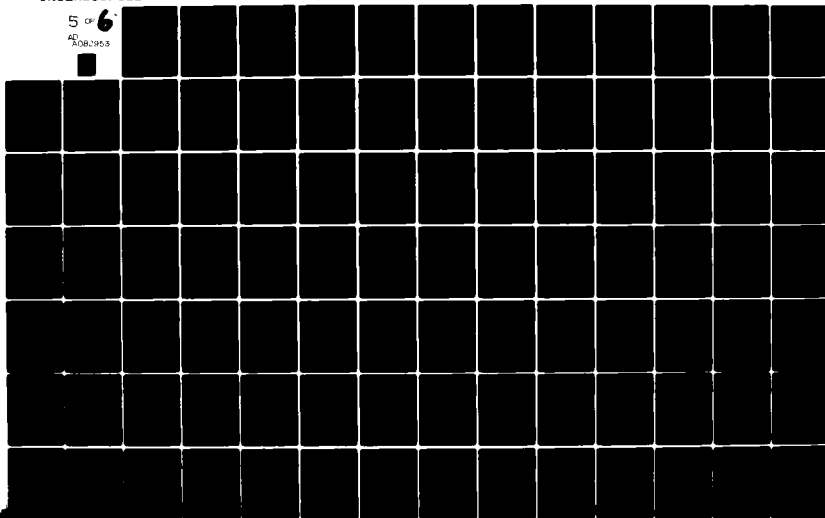
HUMAN RESOURCES RESEARCH ORGANIZATION ALEXANDRIA VA F/G 5/9
SURVEY OF ARMY WEAPONS TRAINING AND WEAPONS TRAINING DEVICES.(U)
APR 76 M R MCCLUSKEY, D F HAGGARD, T R POWERS DAHC19-73-C-0057

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FIELD ARTILLERY

DESCRIPTION OF TRAINING DEVICE FOR THE Pershing

Level of Training	AIT
Title and Nomenclature of Training Device	Warhead Trainer XM95E1
Description of Training Device	Almost same physical characteristics as tactical round, electrical capability for T 4127 A Test
Course of Instruction Utilizing Training Device	
Title	Firing Battery Operations
Total Number of Hours	54
Number of Instructional Hours Scheduled for Training Device	54
Total Amount of Time Each Trainee Uses Device	20
Phase, Period, or Block of Course Where Device is Used	
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	Assembly of warhead section to missile electrical test & check-out, nuclear weapons training

Percentage of Total Firing Practice for the Weapon Conducted with the Following: Training Device Live Firing Dry Firing Other	100%
Training Device Costs Cost of Each Device Number of Devices Required per Course Expected Life of Device Maintenance Costs Per Year Cost Per Round (Where Appropriate)	2

APPENDIX F

FIELD ARTILLERY

DESCRIPTION OF WEAPONS TRAINING
FOR THE 155mm HOWITZER (M-109)
AND THE 8-INCH HOWITZER (M-110)

INTRODUCTION

GENERAL

The tactical mission of the United States Field Artillery is to provide continuous and timely fire support to the maneuver force commander by destroying or neutralizing, in priority, those targets that jeopardize the accomplishment of his mission. In order to accomplish this mission, the Field Artillery will:

1. Support the maneuver forces with timely, close and accurate fires on hostile maneuver elements, to include nuclear, biological, and chemical, as authorized and required.
2. Deliver counterbattery fires throughout the range of each weapon system.
3. Give depth to combat by delivering fires on logistical installation, reserves, command posts, communication facilities, and other targets throughout the area of influence of the supported force.¹

The development of nuclear, biological, and chemical weapons and their delivery systems has had an impact on the tactics of all combat arms. Even though nuclear weapons may not be employed, they pose a constant threat to all operations. When the threat of nuclear war exists, non-nuclear war will assume many of the aspects of nuclear war including detailed planning for the initiation of nuclear combat and a continuing analysis of friendly vulnerability. Similarly, those tactics which are applicable to the employment of artillery in non-nuclear warfare are applicable under biological and chemical conditions.

¹FM 6-20, August 1973

Artillery units are employed by divisions, corps, and field armies. Field Artillery battalions organic to a division artillery provide the minimum fire support required for the maneuver units of the division. Field artillery battalions may be assigned one of four standard tactical missions. Listed in descending order by degree of centralized control retained, they are: (1) general support; (2) general support-reinforcing; (3) reinforcing; and (4) direct support. The responsibilities inherent to each of these standard missions are reflected in Table F-1. The 155mm and 8-inch self-propelled howitzers are found only in the Mechanized Infantry and Armored Division Artillery's Battalions. The specific organization of these DIVARTYs is as shown in Figure F-1. It should be noted that the field artillery elements of any division must enjoy mobility that is equal to, or greater than, the mobility of the supported maneuver forces. The artillery organic to a division is the minimum required for combat, however, additional artillery support, when required, is provided by Corps Artillery. The functions of Corps Artillery are: (1) Augment the fires of division artillery; (2) provide long-range fires; and (3) provide counterbattery fires.²

FIELD ARTILLERY SYSTEMS

The United States Army's Field Artillery weapons are classified as cannons or missiles. Cannons are classified, by type, as guns, howitzers, or mortars. Guns have relatively long barrels, operate with a relatively low angle of fire and have a high muzzle velocity. Howitzers have medium length barrels (between those of guns and mortars) and operate with a relatively high angle of fire, and have a medium muzzle velocity. Mortars normally operate with the highest angle of fire and have the lowest muzzle velocity, and are not normally employed by field artillery. Additionally, Field Artillery cannons are further classified according to caliber (tube diameter), as follows: (1) Light. 120mm or less; (2) Medium. Greater than

² Ibid.

120mm but not greater than 160mm; (3) Heavy. Greater than 160mm but not greater than 210mm; (4) Very Heavy. Greater than 210mm. (Very heavy cannons are not employed by active Army field artillery units.) Missiles, on the other hand, are classified, by type, as rockets or guided missiles, and further classified by range characteristics.³

Field Artillery weapons are further classified according to their method of transport, as follows: (1) Towed. Weapons mounted on carriages designed to be towed or transported by a separate vehicle (generally termed a prime mover). A towed weapons may be auxiliary propelled by a mounted propulsion means; (2) Self-Propelled (SP). Cannons and launchers installed on carriages which provide automotive power for the vehicle and the weapons; and (3) Aerial. Artillery weapons mounted upon or structurally integrated with aircraft, which serve as the primary means of mobility and from which the weapons can be fired.⁴

All Field Artillery battalions are self-sustaining. The battalion is both a tactical and an administrative organization. Within each battalion, the number of "firing" and "nonfiring" batteries is prescribed by the appropriate battalion table of organization and equipment and depends on the mission and assignment of the battalion. The "firing" unit is the cannon (howitzer/gun) battery. The "nonfiring" units include the HQ & HQ battery; the HQ, HQ & Service Battery; and Service Battery.⁵

The battery is the smallest tactical and administrative unit of the Artillery Battalion. Normally, the battery relies upon battalion for administrative and logistical support. In a counterinsurgency operation, the battery may be self-sustaining or may be satellited on other units for support. The mission of the Field Artillery Cannon Battery is to provide the firing component of the Field Artillery Cannon Battalion and to furnish its portion of the battalion communications system. The Cannon Battery has the personnel and equipment necessary to deliver fire, communicate, move and perform limited

³Chapter 2, FM 6-20, August 1973

⁴FM 6-20, August 1973

⁵Ibid

administration. Cannon batteries with organic forward observers have a significant target acquisition capability. It may operate as a separate tactical unit for a limited period of time. The organization of all cannon batteries is fundamentally the same with the exception of the number and type of cannon authorized.

Table F-1

Field Artillery Tactical Missions*

A Field Artillery unit with a mission of	Answers calls for fire from	Establishes liaison with	Establishes communication with	Has as its zone of fire	Furnishes forward observer	** Displaces When	Has its fires planned by
General Support	Force artillery headquarters. Own observers	No inherent requirement	No inherent requirement (internal communication only)	Zone of supported unit	No inherent requirement	Ordered by force headquarters. Ordered by higher artillery headquarters	Force artillery headquarters
General Support-Reinforcing	Force artillery headquarters. Reinforced artillery unit. Own observers	Reinforced artillery unit	Reinforced artillery unit	Zone of supported unit to include zone of reinforced artillery unit	Upon request of reinforced artillery unit subject to prior approval of force artillery headquarters	Ordered by force artillery headquarters, or upon request of reinforced artillery unit subject to prior approval of force artillery headquarters	Force artillery headquarters

*Taken from FM 6-20, August 1973.

**Notifies the force artillery headquarters of time, position, and fire capabilities.

Table F-1
(cont'd)

A Field Artillery unit with a mission of	Answers calls for fire from	Establishes liaison with	Establishes communication with	Has as its zone of fire	Furnishes forward observer	Displaces When **	Has its fires
Reinforcing	Reinforced artillery unit. Own observers. Force artillery headquarters	Reinforced artillery unit	Reinforced artillery unit	Zone of fire of reinforced artillery unit	Upon request of reinforced artillery unit	Requested by reinforced artillery unit, or ordered by force artillery headquarters	Reinforced artillery unit
Direct Support	Supported unit. Own observers. Force artillery headquarters	Supported unit (down to battalion level)	Supported unit	Zone of supported unit	To each company-sized maneuver element of supported unit	Unit commander deems necessary or ordered by force artillery headquarters	Develops own fire plan

**Notifies the force artillery headquarters of time, position, and fire capabilities.

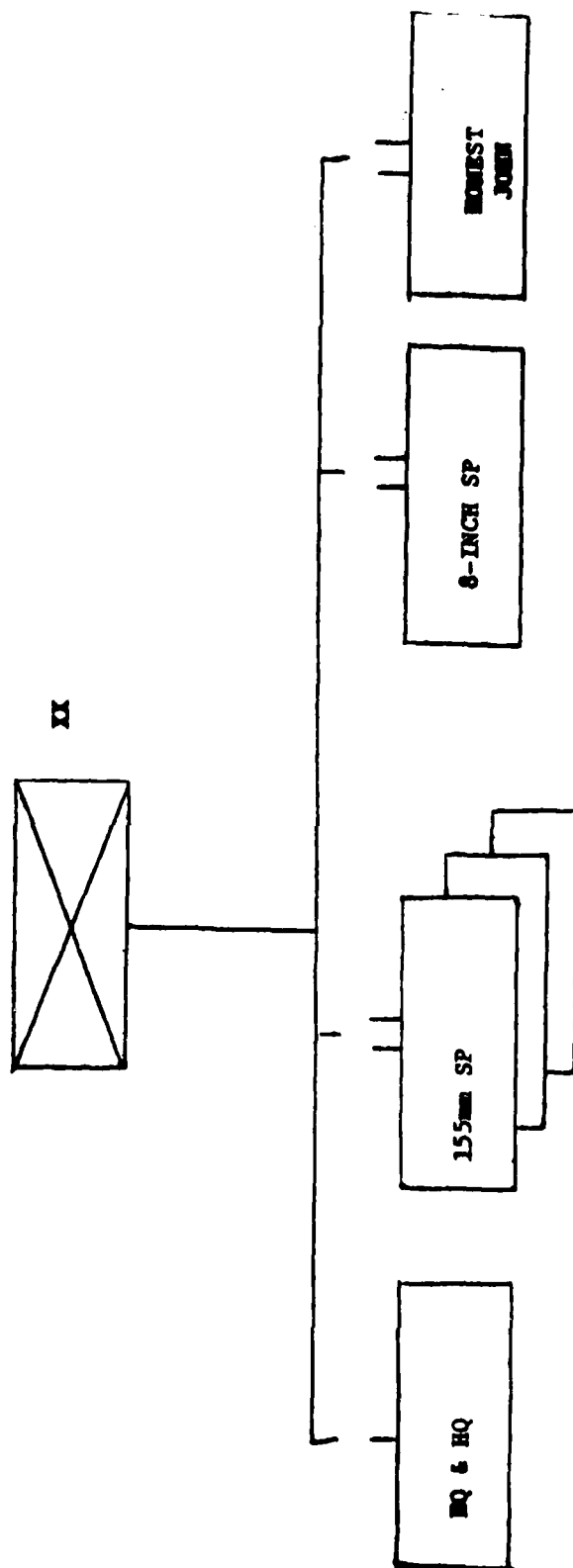


Figure F-1. Mechanized Infantry and Armored Division Artillery.

NOTE: From Field Artillery Reference Data, April 1970

155mm HOWITZER, M-109

The 155mm Howitzer, M-109, is a medium caliber artillery weapon, with a medium length barrel configuration which operates with a relatively high angle of fire and has a medium muzzle velocity. This weapons system is installed on a tracked carriage which serves to self-propel the system.

The maximum range of the 155mm howitzer is 14,600 meters, with a maximum rate of fire of 4 rounds per minute, and a sustained rate of one round per minute. The system has a full 6,400 mils, right and left traverse of the gun turret, with a minimum of -53 mils and maximum of 1,333 mils elevation. The M-109 has a cruising range of 220 miles, and a maximum speed of 37 miles per hour. It is diesel powered with a fuel capacity of 135 gallons. The weight of the system while traveling and in firing position is 52,461 pounds. When the floatation kit is installed, the howitzer has a swimming capability. Its fording depth, however, is 42 inches. The 155mm Howitzer does possess a nuclear-fire capability.

A typical organization for a 155mm Howitzer Battalion, Mechanized Infantry and Armored Division is as shown in Figure F-2.

A 155mm Howitzer Battery (SP) consists of:

- a. Battery headquarters.
- b. Communications section.
- c. Firing battery with six cannon sections.
- d. Ammunition section.
- e. Forward observer section(s) (where applicable by TOE).

The headquarters of the cannon battery provides the personnel and equipment required to perform the administrative, mess, supply, and motor maintenance functions for the battery. The communications section consists of the personnel and equipment required to install and maintain communications for the battery. The ammunition section consists of the personnel and equipment required for ammunition resupply. Finally, the firing battery includes the personnel and equip-

8-INCH HOWITZER, M-110

The 8-inch Howitzer, M-110, is a heavy caliber artillery weapon. It, like the 155mm Howitzer, M-109, has a medium length barrel configuration which operates with a relatively high angle of fire and has a medium muzzle velocity. This weapons system is installed on a tracked carriage which serves to self-propel the system. The motor carriages of the 8-inch Howitzer, M-110, and the 175mm gun, M-107, are identical. The singular difference in these two weapons systems is in the tubes.⁶

The maximum range of the 8-inch Howitzer is 16,800 meters, with a sustained rate of fire of 0.5 rounds per minute. The system has a 533 mil right and left (from center) traverse of the gun turret, with a +35 to +1156 mils elevation limit. The M-110 has a cruising speed of 20 miles per hour and a maximum allowable speed of 34 miles per hour. It is powered by an 8 cylinder, liquid-cooled turbo-charged, diesel engine. The fuel capacity of 320 gallons permits a cruising range of 450 miles. The weight of the system, while traveling and in firing position, if combat-loaded is 62,100 pounds.⁷ The maximum fording depth of the M-110 is 42 inches. The 8-inch Howitzer does possess a nuclear-fire capability.

A typical organization for a Field Artillery Battalion, 8-inch, Self-propelled, is as shown in Figure F-3.

An 8-inch Howitzer Battery (SP) consists of:

1. Battery headquarters.
2. Communications section.
3. Ammunition section.
4. Security section.
5. Firing Battery with four howitzer sections⁸.

Each of the four Howitzer Sections in the 8-inch Howitzer battery consists of the section personnel; an 8-inch Howitzer, M-110, Self-Propelled; and section vehicle; and certain auxiliary equipment specified by the applicable Table of Organization and Equipment. The section personnel include:

⁶ FM 6-94, May 1968.

⁷ TM 9-2300-216-10, October 1968.

⁸ FM 6-94

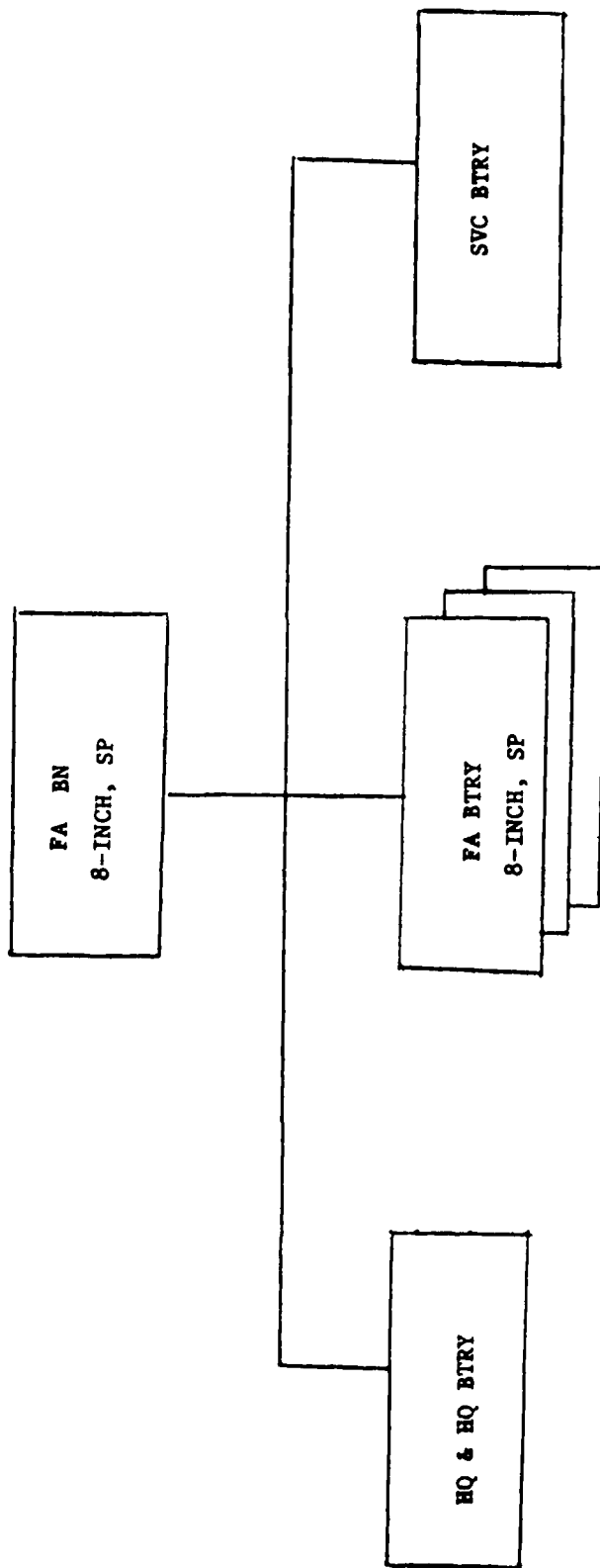


Figure F-3. Field Artillery Battalion, 8-Inch, Self-Propelled, TOE 6-445G

NOTE: From FA Reference Data, April 1970

1. A Chief of Section (CS).
2. A Gunner (G).
3. An Assistant Gunner (AG).
4. Eight Cannoneers 1 through 8.
5. A Motor Carriage Driver (MD).
6. A Section Vehicle Driver (SD).

Duties of personnel within an 8-inch Howitzer Section are similar to those for personnel in a 155mm Howitzer Section.

TRAINING CONTENT

TASK ANALYSIS PROCEDURES

Prior to a discussion of how the performance requirements were determined for each course of instruction, it should be remembered the field artillery, to be successful, must work as a team. The field artillery gunnery team consists of the following elements - observers, fire direction center, and firing battery. The following table reflects the USA Field Artillery Schools training programs in support of this concept.

Training Received

	155mm How(SP) Firing Battery	8 in. How(SP) Firing Battery	Fire Direc- tion (1)	Observed Fire (1)
A Subj Schd 6-13A10	X	X		
A Subj Schd 6-13E20			X	X
NCO Basic Course	X	X	X	X
NCO Advance Course	X		X	X
Officer Basic Course	X	X	X	X

Table F-2 Course Content

- (1) Fire direction and observed fire procedures are almost equally applicable to all cannon weapon systems.

Various methods were used in determining the performance requirements identified in the current Army Subject Schedules 6-13A10 and 6-13E20. In discussion with members of the U.S. Army Field Artillery School (USAFAS), it was generally concluded that training objectives and performance standards were developed for these Subject Schedules by the following means:

1. Committee 75%
2. MOS Data Bank 10%
3. Field Commander 5%
4. Previous Observation by Departmental Personnel 5%
5. Individual Analysis 5%

It was additionally concluded that revision of these Subject Schedules will be accomplished in the near future, utilizing research products (task inventories) contributed to by USAFAS and provided by U.S. Army Combined Arms Training Board. These task inventories were subjected to field validation by job incumbents, senior NCO's and officers.

In the case of the Programs of Instruction (POI) for Field Artillery Cannon Senior Sergeant NCO Advanced Course and Field Artillery Cannon NCO Basic Course, the task analysis was accomplished in a slightly different fashion. While a committee of subject matter experts were principally responsible for developing the performance requirements, they were assisted by informational inputs from the following sources, to which percentages could not be attached:

1. MOS Study Guides
2. Senior NCO Panel
3. Questionnaire
 - a. Resident Students
 - b. After assignment to initial duty position upon graduation
4. AR611-201, Enlisted Military Occupational Specialties
5. Previous Observation by Committee Members

6. Field Commanders
7. Individual Interview

The performance requirements for POI Field Artillery Officer Basic Course were developed in a similar fashion to the NCO Basic and Advanced Courses, but using slightly different informational sources which follow:

1. Field Trips
2. Students After Assignment to Initial Duty Assignments
3. Previous Observation by Committee Members
4. Newly Assigned Personnel
5. U.S. Army Combat Developments Command Field Artillery Agency (formally)

UTILIZATION OF MISSION PROFILES

No mission profiles per se were used in the development of the task inventories. While it was felt that these might have been useful if available, it was additionally felt that the individual expertise of committee members plus accomplishment of the job identification phase of systems engineering eliminated the need for mission profiles. It was additionally stated that they would be developed to assist in the design of training for new weapon systems.

AMOUNT OF TRAINING REQUIRED FOR PROFICIENCY

The number of rounds required for an acceptable level of proficiency has been identified through feedback from previously conducted courses. But this in itself does not provide a clear picture on how these rounds per student impact on training for the individual student.

In the case of cannoneer training (AIT), or gun crew training at higher levels, one round per student in essence means that each student will be in each position of the gun crew as one live round is passed through the weapon system. In other words his individual allocation of rounds for training has been multiplied by the number of crew members, and this number would actually reflect the number of live rounds he would be exposed to in his training.

On the other hand observed fire training exercises principally benefit the individual who is directing the fires while other class members participate vicariously. While true that nonparticipating members could provide gun crew or FDC personnel, it is rather distracting to the student to receive a poor grade in observed fire procedures due to an error at the guns or FDC created by inexperienced personnel. In this case, the round allocation per student principally supports the individual student and little benefit is derived by the rest of the class members. Additionally, observed fire training calls for the student to accomplish a single task which entails the firing of approximately six rounds as would any replication of the same task. Thus, large quantities of ammunition may be required to support this type of training.

TRAINING METHODS

This section is limited to those practical exercises provided in a course of instruction which permit the trainee to practice some aspect of the duties of a field artillery team member. The exercises are described in sufficient detail to present a picture of the training and include training method, type of practical exercise and proficiency measurement information. The tables are presented in the following order:

155mm Howitzer Training

8-in Howitzer Training

FDC Procedure Training

Observed Fire Training

Training on the 105mm Howitzer was included in the 155mm Howitzer section as it was felt that this training had a high degree of transfer to both weapon systems, 155mm and 8-in., but need not be repeated twice, i.e., in 8-in. section. It was also felt there was a high degree of transfer of training from 155mm system to the 8-in system which somewhat explains the shortness of the 8-in Howitzer Training Tables.

FIELD ARTILLERY

155mm HOWITZER TRAINING

AIT 13A10

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
Artillery Weapons. To provide a general knowledge of the nomenclature, characteristics, functions of major components, assembly and disassembly, and maintenance of artillery weapons.			
Period 4. Nomenclature, assembly, & disassembly of the breech & firing mechanisms of the 105mm howitzer M101A1. Training objective. The trainee will be able to assemble and disassemble the breech and firing mechanisms.	Conference 15% Demonstrations 20% Practical Exercise 65%	Hands-On	Disassemble and assemble the Breechblock and M13 firing lock performance test
Period 5. Nomenclature and maintenance of the barrel group of the 105mm howitzer M101A1. Training objective. The trainee will be able to perform maintenance on the barrel group.	Conference 50% Practical Exercise 50%	Hands-On	Lubrication Performance Test
Period 7. Nomenclature, assembly, & disassembly of the breech & firing mechanisms of the 155mm howitzer M114A1. Training objective. With assistance the trainee will be able to assemble & disassemble the breech & firing mechanisms of 155mm howitzer M114A1.	Conference 15% Demonstrations 30% Practical Exercise 55%	Hands-On	Assembly and disassembly of the breech mechanism performance test

FIELD ARTILLERY

155mm HOWITZER TRAINING

AIT 13A10

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>Period 11. Electrical and main hydraulic systems on the 155mm Howitzer M109. Training Objective. Under supervision, the trainee will be able to operate the electrical and hydraulic systems on the 155mm Howitzer M109</p> <p>Period 13. Barrel & breech of self-propelled weapons. Training objective. The trainee will be able to:</p> <p>1-Properly disassemble & assemble the self-propelled 155mm Howitzer M109 breech.</p> <p>2-Identify & perform proper maintenance on all self-propelled cannon tubes.</p> <p>Field Training Exercise. Administrative Note. At times when trainees are not engaged in formal training, they should be required to occupy tactical-type positions & practice normal requirements associated therewith, such as tactical feeding camouflage, local security, light & noise discipline & measures against air & armor attack.</p>	<p>Conference 5%</p> <p>Practical Exercises 95%</p> <p>Conference 50%</p> <p>Practical Exercise 50%</p>	<p>Hands-On</p>	<p>Cannon Maintenance Performance Test</p>

FIELD ARTILLERY

155mm HOWITZER TRAINING

AIT 13A10

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>Period 1. The artillery team. Training objective. The trainee will be able to explain the relationship between the observer, fire direction center, and firing battery</p> <p>Period 3. Night operations. Training objectives. The trainee will be able to perform the duties of cannoneer during the hours of darkness.</p> <p>Period 7. Service practice, 105mm howitzer. Training objective. The trainee will develop proficiency in firing battery operations during live firing exercises by integration and application of all previous training.</p>	<p>Conference 15% Demonstrations 10% Practical Exercise 75%</p> <p>Prac. Exercise 100%</p>	<p>Live Fire 100 Ctg. HE, 105/Demo 16 Proj, HE, 155/Demo 6 Proj, HE, 8in/Demo 3 Proj, HE, 175/Demo</p> <p>Hands-On</p> <p>Hands-On Live Fire 1 Ctg, TP-T, 105 per student 3.5 Ctg, HE, 105 per training device 5 Ctg, 7.62 per student</p> <p>Hands-On Live Fire 1.5 Proj, HE, 155 per student</p>	<p>All Performance Tests</p> <p>All Performance Tests</p> <p>All Performance Tests</p>

FIELD ARTILLERY

155mm HOWITZER TRAINING

AIT 13A10

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
Period 2. Artillery fuze setters and wrenches. Training objective. The trainee, using the proper tools, will be able to set selective and mechanical time fuzes	Conference Practical Exercises 30% 70%	Hands-On Training Devices	Ammunition Identification and Fuze Setting Performance Test
Period 3. Commands and formations. Training objective. The trainee will be able to recognize and respond to the commands and recognize the formations used in maintaining control of the howitzer section.	Conference Demonstration Practical Exercise 20% 20% 60%	Hands-On	All Performance Tests
Period 4. Duties of cannoneers in prepare for action, march order, & firing, 105mm howitzer M101A1. Training Objective. The trainee will be able to perform the duties of cannoneer and, under supervision, perform the duties of assistant gunner & gunner in prepare for action & march order, laying, and firing of the M101A1	Conference Demonstration Practical Exercise 7% 13% 80%	Hands-On	Duties of the Cannoneer to prepare for action and march order performance test.

FIELD ARTILLERY

155mm HOWITZER TRAINING

AIT 13A10

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objective.
Period 5. Fire control equipment peculiar to the M101A1. Training objective. The trainee will know the procedures employed in the operation of on-carriage fire control equipment	Conference 20% Demonstration 20% Practical Exercise 60%	Hands-On	
Period 6. Fire control equipment peculiar to the M102. Training objective. The trainee will be familiar with the procedures employed in the operation of on-carriage fire control equipment.	Conference 20% Demonstration 20% Practical Exercise 60%	Hands-On	
Period 7. Fire Commands. Training objectives. The trainee will be able to respond to the elements of a fire command.	Conference 23% Demonstration 17% Practical Exercises 60%	Training Aid Devices	
Period 8. Aiming posts (collimator) & correcting for piece displacement. Training objective. The trainee will be able to emplace aiming posts & the collimator M1 and, under supervision, correct for piece displacement.	Conference 7% Demonstrations 28% Practical Exercise 65%	Hands-On	Emplacing Aiming Posts Performance Test

FIELD ARTILLERY

155mm HOWITZER TRAINING

AIT 13E20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>Firing Battery. To familiarize the trainee with the characteristics of field artillery howitzers and sighting and laying equipment with the duties of the weapon crewman.</p> <p>Period 1. Firing battery orientation. Training objective. The trainee will be familiar with howitzers, and sighting and laying equipment and with the duties of the howitzer crewman</p>	<p>Demonstration 28%</p> <p>Practical Exercise 72%</p>	Hands-On	

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FIELD ARTILLERY

155mm HOWITZER TRAINING

OFFICERS BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GB02AZ - Laying (Combined 070/091) Objective - Student will be able to issue the proper commands and lay the battery using the aiming circle, M2 compass or the aiming point and deflection method. (Problem includes 1.7 hours after duty hours.)</p>	<p>C 24% PE 76%</p>	<p>Hands-On</p>	<p>By demonstrating his knowledge of instructional material GB0208, GB0210</p>
<p>GB02BP - Measuring and Reporting (Combined 110/121). Objective - Student will be able to issue the proper commands, measure azimuth and orienting angle and report the adjusted deflection, azimuth and orienting angle.</p>	<p>C 28% PE 72%</p>	<p>Hands-On</p>	<p>By demonstrating his knowledge of instructional material</p>
<p>GB02BL - Executive Officer's Report Objective - Student will be able to prepare and render the executive officer's report. Ref: FM6-40</p>	<p>C 44% PE 56%</p>	<p>Hands-On</p>	<p>By demonstrating his knowledge of instructional material GB0209, GB0210</p>
<p>GB02CO - Duties of the Safety Officer Objective - Student will be able to perform the duties of the safety officer</p>	<p>C 30% PE 70%</p>	<p>Hands-On</p>	<p>By demonstrating his knowledge of instructional material</p>

FIELD ARTILLERY

155mm HOWITZER TRAINING

OFFICERS BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GB02UA - Firing Battery Procedures</p> <p>Objective - Student will observe and perform firing battery procedures to include errors in firing, boresighting prefire checks, section equipment, care and handling of ammunition, misfire procedures, piece displacement, aiming point displacement, sit to crest, laying and measuring and executive officer's report and records sheet (Firing)</p>	<p>C 12%</p> <p>PE 88%</p>	<p>Live Fire</p> <p>20 Ctg, HE, 105 per PE</p>	<p>By demonstrating his knowledge of instructional material</p> <p>GB0210</p>
<p>GB02UM - Duties in the Firing Battery during preparation for action, march order and firing. objective - Student will perform the duties of the executive officer, chief of section and cannoneers during preparation for action, march order and firing of the M102 105mm howitzer. Students will occupy firing position, emplace and fire the weapon and march order (Firing.)</p>	<p>PE 100%</p>	<p>Live Fire</p> <p>4 Ctg, TP-T, 105 per student</p> <p>4 Ctg, A-Pers, 105 per PE</p>	<p>By demonstrating his knowledge of instructional material</p> <p>GB0210</p>

FIELD ARTILLERY
155mm HOWITZER TRAINING
OFFICERS BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
GB02UN - Duties in the Firing Battery during preparation for action, march order and firing. Objective - Student will perform the duties of the executive officer, chief of section and cannoneers during preparation for action, march order and firing of the M109 155mm howitzer. Students will occupy firing position, emplace and fire the weapon and march order (Firing.)	PE 100%	Live Fire 5 Proj, HE, 155 per student	By demonstrating his knowledge of instructional material GB0210
GU02EM - Field Artillery Firepower and Air Firepower. Objective - The student will be able to discuss the various fire support techniques to include small arms, artillery, and tactical air	D 100%	Live Fire	
TI02QQ - Mechanized Rifle Company Team D in the Attack. Objective - The student will be able to discuss the organization, mission and capabilities of a mechanized rifle company team supported by artillery.	D 100%	Live Fire	

FIELD ARTILLERY

155mm HOWITZER TRAINING

OFFICERS BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
TR02FT - SHOT (Student Highlights of Training) (Peacetime). Objective-The students will perform duties as members of the field artillery gunnery team and various duties related to communications, maintenance, target acquisition and artillery tactics. (Instructors from T/CAD, GD, MMD, CLTD, CED and TAD will participate)	PE 100%	Live Fire 6.3 Ctg, HE, 105 per PE 2 Ctg, HE, 105 per student	
TR02FA - Field Artillery Battery RSOP (Demonstration). Objective-Student will be able to apply correct RSOP techniques for both a hasty and deliberate occupation. (Integrated instruction in communications, gunnery and maintenance is also presented.)	D 100%	Live Fire - Demo 132 Proj, HE, 155/Demo	By demonstrating his knowledge of material covered on TR0201
TR02FX - FA Battery in Combat Operations (Peacetime). Objective-Students will perform practical work in techniques of RSOP, defense against armor, radio procedures and wire installations laying and referring both towed and SP field artillery weapons preparation for movement by air, erection of drap net sets, care & cleaning of small arms & crew weapons.	PE 100%	Live Fire Training Device 2 Ctg, 14.5 per student	By demonstrating his knowledge of material covered

FIELD ARTILLERY

155mm HOWITZER TRAINING

OFFICERS BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
TRO2FZ - FA Battalion in Combat Operations (Peacetime). Objective - Students will perform various assigned duties throughout the exercise, implementing the fundamentals and techniques of reconnaissance, selection, occupation and defense of a FA Battery position. Students will also perform practical work in deliberate and emergency occupations, defense against armor, day and night occupations and displacements, service of the piece, erection of drupe net sets, conduct of fire, communications, care and maintenance of equipment, survey, defensive measures, airborne operations, and limited staff officer training. (T/CAD, TAD, CED, MMD, GD, and CLTD will participate.) (46.6 hours after normal duty hours)	PE 100%	<p>Live Fire 30 Ctg, Blank, 105/PE 742 Ctg, HE, 105/PE 44 Ctg, Illum, 105/PE 48 Ctg, HC, 105/PE 15 Ctg, WP, 105/PE 4 RKT, Smk, 2.75/PE 2 Ctg, HE, 105 per Student Live Fire -Training Device 240 Ctg, 14.5/PE</p>	By demonstrating his knowledge on material covered.

FIELD ARTILLERY

155mm HOWITZER TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objective.
<p>TR40 FA - FA Battery RSOP</p> <p>Objective:</p> <p>Student will describe the considerations of reconnaissance, selection, and occupation of a position for a FA cannon battery to include an occupation without prior reconnaissance (hip-shoot); and active and passive defense measures used by the battery (13 B and 13 E)</p> <p>TR40 EU - Battery Defense Against Armor</p> <p>Objective:</p> <p>Student will demonstrate techniques of defense of a FA battery against armor, describe vulnerabilities of armor, methods of leading tanks, and fire the 14.5 subcaliber device in direct fire against armor (13 B and 13 E).</p>	<p>100 D</p>	<p>Live Fire 88 Proj., HE 155mm/ Demonstration</p>	<p>By examination TR 4002</p>
	<p>50 C 50 PE</p>	<p>Live Fire 5 rd/Student Training Device (14.5)</p>	<p>By examination TR 4002</p>

FIELD ARTILLERY

155mm HOWITZER TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
GB4BAZ - Laying Objective: Student will be able to understand the principles of reciprocal laying, procedures and practices in initial laying, laying by azimuth and orienting angle. (13 B only)	50 C 50 PE	Hands-on	By practical exercise examination GB4B05
GB4BBI - Laying by Azimuth and Orienting Angle Objective: Student will be able to lay the battery by azimuth and orienting angle with M2 aiming circle using howitzers to report weapon data. (13 B only)	100 PE	Hands-on	By practical exercise examination GB4B05

FIELD ARTILLERY

155mm HOWITZER TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GBABGH - Duties of Personnel in Firing Section, M101A1</p> <p>Objective:</p> <p>Student will be able to perform the duties of gunner and chief of section in a 105mm towed howitzer battery in preparation for action, firing and march order. (13 B only)</p>	100 PE	Hands-on	By practical exercise examina- tion BC4B03.
<p>GBABUE - Duties of Howitzer Section During Firing, M101A1</p> <p>Objective:</p> <p>Student will be able to perform duties of the gunner and chief of section during firing of 105mm towed howitzer, M101A1. Firing. (13 B only)</p>	100 PE	Live Fire 10 Ctg, HE, 105/Student	By practical exercise examina- tion BC4B03.

FIELD ARTILLERY
155mm HOWITZER TRAINING
NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
GB4BGQ - Duties of Personnel in Firing Section, M102 Objective: Student will be able to perform duties of gunner and chief of section in 105mm howitzer, M102 battery in preparation for action firing and march order. (13 B only)	40 C 60 PE	Live Fire 7 Ctg, HE, 105/Student	By practical exercise examination BG4B02.
GB4BUP - Duties of Howitzer Section During Firing, M102 Objective: Student be able to perform the duties of gunner and chief of section during firing of 105mm towed howitzer, M102. Live firing. (13 B only)	100 PE	Hands-on	By practical exercise examination BG4B02.

FIELD ARTILLERY

155mm HOWITZER TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
CB4BGZ - Duties of Personnel in Firing Section, M114A1 Objective: Student will be able to perform duties of gunner and chief of section in 155mm towed howitzer, M114A1 battery in preparation for action, firing and march order. (13 B only)	100% Practical exercise	Hands-on	By practical exercise examination BG4B03
CB4B0H - Duties of Howitzer Section During Firing, M114A1 Objective: Student will be able to perform the duties of gunner and chief of section during firing of 155mm towed howitzer, M114A1. Live firing (13 B only)	100% Practical exercise	Live Fire 4.5 Proj., HE, 155/STUD.	By practical exercise examination BG4B03

NCO BASIC COURSE

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FIELD ARTILLERY

155mm HOWITZER TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GB4BIE - Duties of Chief of Section</p> <p>Objective:</p> <p>Student will be able to perform duties of chief of section in firing battery in preparation for action, firing, march order and maintenance of the M101A1, M102, M109, M110, and M114. (13 B only)</p> <p>AS4BEQ - Care and Use of the M2 Aiming Circle and Simultaneous Observation</p> <p>Hours - 8.4 U 1.7C, 6. 7PE1</p> <p>Objective:</p> <p>In an outside training area using an M2 Aiming Circle, the student will be able to set up, level and measure angles with the instrument. Further, the student will be able to perform the field work and computations for establishing direction by simultaneous observation. (13 B only)</p>	<p>100% Practical exercise</p> <p>20% Conference 80% Practical exercise</p>	<p>Hands-on</p> <p>Hands-on</p>	<p>Method of Measuring Attainment of Course Objectives.</p>

FIELD ARTILLERY

155mm HOWITZER TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GB4BUG - Duties of Howitzer Section During Battery Operation, M102.</p> <p>Objective:</p> <p>Student will be able to perform the duties of gunner and chief of section in 105mm towed howitzer, M102, battery during non-firing battery operation, 6400m environment, and hip shoot (13 B only)</p>	100% Practical exercise	Hands-on	By practical exercise examination GB4B02
<p>GB4BUK - Duties of Howitzer Section During Battery Operation, M109.</p> <p>Objective:</p> <p>Student will be able to perform the duties of gunner and chief of section in 155mm self-propelled howitzer, M109 battery during non-firing battery operation, 6400m environment, and hip shoot (13 B only)</p>	100% Practical exercise	Hands-on	By practical exercise examination GB4B04.

FIELD ARTILLERY

155mm HOWITZER TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GB4EAU - Firing Battery Procedures and Practices.</p> <p>Objective:</p> <p>Student will be able to perform duties of firing battery person- nel in a 105mm howitzer battery and use the on-carriage fire control equipment and collimator. (To be conducted in conjunction with GD4BTA.) (13 E only)</p>	<p>100% Practical exercise</p>	<p>Live Fire 4.8 Ctg., HE, 105/STUD. 4.8 Proj., HE, 155/STUD.</p>	

FIELD ARTILLERY

155mm HOWITZER TRAINING

NCO ADVANCE COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
GFB101, GB35BN. Title: Laying and Measuring. Objective-the student will be able to lay the battery by azimuth and orienting angle and measure adjusted azimuth and orienting angle.	Practical Exercise 100%	Hands-On	
FB35NB, GFB991. Title: Duties of the Firing Section of the M101A1, M102, M14, M109 and M110. Objective - the student will be able to enumerate the duties of the personnel of the M101A1, M102, M114, M109 and M110. The class will be conducted in round robin fashion with two periods of instruction on each weapon.	Practical Exercise 100%	Hands-On	By written examination GD35LK
GB35NC, GOF072, GFB212. Title: Duties of the Executive and other firing battery personnel in firing/observed fire procedures. Objective - the student will perform the duties of firing section personnel and observers (splitshoot).	Practical Exercise 100%	7Ctg, HE, 105 per student	

FIELD ARTILLERY

8-INCH HOWITZER TRAINING

AIT 13A10

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>(1) <u>Period 1.</u> The artillery team.</p> <p>(a) <u>Training objective.</u> The trainee will be able to explain the relationship between the observer, fire direction center, and firing battery.</p>	<p>This period also reflected in 155 Howitzer training</p>	<p>Demonstration Live-Fire (See Period 1, Field Training exercise, 155 Howitzer Training, AIT 13A10)</p>	
<p>(11) <u>Period 11.</u> Duties of the cannoneers on all self-propelled howitzers, to include prepare for action, firing, and march order.</p> <p>(a) <u>Training objective.</u> The trainee will be able to perform the duties of cannoneer in all self-propelled howitzer sections.</p>	<p>This period also reflected in 155 Howitzer training</p>	<p>(See period 11, Firing Battery, 155 Howitzer Training, AIT 13A10)</p>	

FIELD ARTILLERY

8-INCH HOWITZER TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GB4BFY - Duties of Personnel in Fir- ing Section, M110 and M107.</p> <p>Objective:</p> <p>Student will be able to perform duties of gunner and chief of section in 8-inch SP howitzer, M110 battery and 175mm SP gun, M107 battery in preparation for action, firing and march order. (13 B only)</p>	<p>C 18%</p> <p>PE 82%</p>	<p>Hands-on</p>	<p>By practical exercise examination GB4B01</p>
<p>GB4BUD - Duties of Howitzer Section During Firing of M110</p> <p>Objective:</p> <p>Student will be able to perform duties of gunner and chief of section during live firing of 8-inch SP, M110. (13 B only)</p>	<p>C 22%</p> <p>PE 78%</p>	<p>Live Fire 2.5 Proj., HE, 8-inch/STUD</p>	<p>By practical exercise examination GB4B01</p>

FIELD ARTILLERY

8-INCH HOWITZER TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GB4BJL - Duties of Howitzer and Gun Sections During Battery Operations, M110 and M107</p> <p>Objective:</p> <p>Student will be able to determine special requirements and use special procedures for emplacing self-propelled howitzer M110 and self-propelled gun M107; perform duties of gunner and chief of section during non-firing battery operations; use of special procedures in 6400# environment. (13 B only)</p> <p>GB4BIE - Duties of chief of section.</p> <p>Objective:</p> <p>Student will be able to perform duties of chief of section in firing battery in preparation for action, firing, march order and maintenance of M101A1, M102, M110 and M114 (13 B only)</p>	<p>PE 100%</p> <p>This period also reflected in 155 Howitzer Training</p>	<p>Hands-on</p> <p>(See period GB4BIE 155 Howitzer Training, NCO Basic)</p>	<p>By practical exercise examination GB4B01</p>

FIELD ARTILLERY

8-INCH HOWITZER TRAINING

NCO ADVANCE COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>CB35NB - Duties of the Firing Section of the M101A1, M102, M114, M109 and M110.</p> <p>Objective:</p> <p>The student will be able to enumerate the duties of the personnel of the M101A1, M102, M114, M109 and M110. The class will be conducted in round robin fashion with two periods of instruction on each weapon.</p>	<p>This period also reflected in 155 Howitzer Training</p>	<p>Hand-on (See period CB35NB, 155 Howitzer Training NCO Advance)</p>	

FIELD ARTILLERY
8-INCH HOWITZER TRAINING
OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GB02JP - Duties in the Firing Battery during Preparation for Action, March Order and Firing</p> <p>Objective:</p> <p>Student will perform the duties of the executive officer, chief of section and cannoneers during preparation for action, march order and firing of the M10 8-inch howitzer. Students will occupy firing position and emplace and march order the weapon. (Nonfiring.)</p>	<p>PE 100%</p>	<p>Hands-on</p>	<p>By demonstrating this knowledge of instructional material GB0210.</p>

FIELD ARTILLERY

FDC PROCEDURES TRAINING

AIT 13E20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>Fire Direction. To teach the mission and characteristics of field artillery, the construction of firing charts, the determination of firing data, the duties of fire direction center personnel during the conduct of area and precision fire, and the determination and use of registration corrections are met and VE corrections.</p> <p>Period 2. Field artillery mathematics. Training objective. The trainee will be able to correctly use basic mathematics and algebra in computing fire direction data.</p> <p>Period 3. Duties of the HCO. Training Objectives. The trainee will be able to construct a firing chart using fire direction equipment, to properly prepare the equipment to determine range and deflection, and to orient and use the target grid to locate targets, adjust fire, and measure angle T. The trainee will be familiar with the construction and use of fire control measures.</p>	<p>C 24% D 24% PE 52%</p> <p>D 42% PE 58%</p>	<p>Hands-On</p> <p>Hands-On</p>	<p>Fire direction proficiency, Examination #1 Test 1 - Duties of HCO VCO</p>

FIELD ARTILLERY

FDC PROCEDURES TRAINING

AIT 13E20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
Period 4. Determination of elevation and fuze setting. Training objective. Using the tabular or graphical firing table, the trainee will be able to determine elevation and fuze setting for a given range.	C 18% D 29% PE 53%	Hands-On	Fire direction proficiency Examination #1 Test 5 Determination of Elevation & Fuze Setting
Period 5. Duties of the VCO and computation of site. Training object- tives. Using the tabular firing tables and graphical site tables, the trainee will be able to determine site.	C 10% D 39% PE 51%	Hands-On	Fire direction proficiency Exam #1 Test 1 and Test 6 Duties of HCO and VCO, determination of site.
Period 6. Reinforcement training and review. Training objective. The trainee will reinforce his knowledge and increase his proficiency in the duties of the HCO and the VCO in the determination of accurate firing data.	PE 100%	Hands-On	

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FDC PROCEDURES TRAINING

AIT 13E20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
Period 8. Fire order. Training objective. The trainee will be able to record the fire order in the proper sequence on DA Form 3622 and to combine the fire order with the initial call for fire to determine the message to the observer.	C 56% PF 44%	Hands-On	F.D.P. Exam #2
Period 9. Fire commands. Training objective. The trainee will be able to place fire commands in the proper sequence and will know the meaning of each element of the fire commands and the procedures for correcting commands erroneously transmitted to the firing battery.	C 65% PE 35%	Hands-On	F.D.P. Exam #2
Period 11. Conduct of area fire. The trainee will be able to perform the duties of the computer, including completion of DA Form 3622, in an area fire mission in which HE projectiles with fuzes time, point-detonating, and VT are used.	C 14% PE 86%	Hands-On	F.D.P. Exam #2

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AIT 13E20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
Period 12. Conduct of area fire field exercise. Training objective. The trainee will develop proficiency in the duties of FDC and FO personnel in the execution of area fire missions in which live ammunition is used.	PE 100%	Live Fire 6 Ctg, HE, 105 per student	ALL FDP examinations
Period 13. Reinforcement training and review. Training objective. The trainee will reinforce his knowledge and increase his proficiency in the duties of the computer in the conduct of area fire missions.	C 100%	Hands-On	
Period 15. Precision fire-impact registration. Training objective. The trainee will be able to compute data for an impact precision registration and determine the adjusted elevation and correct deflection by use of fire direction equipment and DA form 6-12	C 18% PE 82%	Hands-On	F.D.P. Exam #3 Test 1 - Precision Fire-Impact Registration.
Period 16. Precision fire-time registration. Training objective. The trainee will be able to conduct the time portion of a precision registration, using DA Form 6-12	C 7% PE 93%	Hands-On	F.D.P. Exam #3 Test 2 - Precision Fire-Time Registration

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AIT 13E20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>Period 17. Registration validation. Training objective. The trainee will be able to determine whether a precision registration is valid.</p> <p>Period 18. Registration corrections. Training objective. The trainee will be able to determine the adjusted deflection, range correction, and fuze correction and to construct a deflection correction scale and a GFT setting from a valid precision registration.</p> <p>Period 19. FDC drill. Training objective. The trainee will increase his confidence in the conduct of a precision registration and in the determination of corrections from such registrations.</p> <p>Period 20. Reinforcement training and review. Training objective. The trainee will reinforce his knowledge and increase his proficiency in the duties of the computer in the determination and application of registration corrections.</p>	<p>C 22% D 54% PE 24%</p> <p>C 8% D 18% PE 74%</p> <p>PE 100%</p> <p>C 100%</p>	<p>Hands-On</p> <p>Hands-On</p> <p>Hands-On</p> <p>Hands-On</p>	<p>F.D.P. Exam #3 Test 3 - Registration validation-Impact</p> <p>F.D.P. Exam #3 Test 5 - Registration Corrections GFT</p> <p>All F.D.P. Exams</p>

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AIT 13E20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>Period 22. Mean-point-of-impact and high-burst registration. Training objective. The trainee will be able to determine the orienting data for the observers, to conduct a high burst of mean-point-of-impact registration, to determine the location of the high burst of mean point of impact by graphic intersection and computation, and to construct a GFT setting from a high-burst or mean-point-of-impact registration.</p> <p>Period 23. Reinforcement training and review. Training objective. The trainee will reinforce his knowledge and increase his proficiency in the duties of the computer in the conduct of high-burst and mean-point-of-impact registrations.</p> <p>Period 25. High-angle area fire. Training objective. Using the appropriate fire direction equipment, the trainee will be able to conduct high-angle area fire missions and achieve the prescribed standards.</p>	<p>C 26% D 28% PE 46%</p> <p>C 100%</p> <p>C 5% D 27% PE 68%</p>	<p>Hands-On</p> <p>Hands-On</p> <p>Hands-On</p>	<p>F.D.P. Exam #4 Test 1 - High-Burst Registration Test 2 - Mean Point of Impact Registration</p> <p>F.D.P. Exam #5 Test 1 - High-Angle Initial Data.</p>

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AIT 13E20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>Period 26. Smoke and Illumination Missions. Training objective. The trainee will be able to perform the duties of computer, including completion of DA Form 3622, in fire missions in which shell white phosphorous, shell smoke, and shell illuminating with shell HE are fired.</p> <p>Period 27. Low-angle precision and high-angle area fire-field exercise. Training objective. The trainee will reinforce his knowledge of the duties of FDC personnel in the conduct of low-angle precision fire and high-angle area fire with live ammunition</p> <p>Period 28. Reinforcement training and review. Training objective. The trainee will reinforce his knowledge and increase his proficiency in the duties of the computer in the conduct of high-angle area fire missions and in the conduct of smoke and illumination missions.</p>	<p>C 11% D 18% PE 71%</p> <p>PE 100%</p> <p>C 100%</p>	<p>Hands-On</p> <p>Live Fire 5 Ctg, HE, 105 per student</p> <p>Hands-On</p>	<p>F.D.P. Exam #5 Test 4 - Special Missions & Munitions. Test 5 - Conduct of Illum. Mission</p> <p>All FDF Exams</p>

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AIT 13E20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objective
Period 30. Meteorological and VE corrections. Training objective. The trainee will be able to determine meteorological (MET) corrections and velocity error (VE) by use of a NATO met message, tabular firing tables, and DA form 6-15	C 10% D 16% PE 74%	Hands-on	F.D.P. Exam #6 Test 1 - Meteorological Correction Concurrent MET.
Period 31. 8-direction met technique. Training objective. Using the 8-direction met technique, the trainee will be able to determine data for firing in a 6,400-mil environment. Gun Direction Computer and Chronograph. To teach the trainee the procedures for determining firing data with the gun direction computer and to teach him the capabilities, chronograph, M36.	C 11% D 31% PE 58%	Hands-On	F.D.P. Exam #6 Test 3 - 8-Direction MET
Period 3. Practical exercise with computer. Training objective. The trainee will solve the gunnery problem by the gun direction computer for determining firing data and firing corrections.	PE 100%	Hands-On	

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Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>Period 5. Field exercise. Trainee objective. The trainee will reinforce his proficiency in the operation of the gun direction computer and chronograph in a simulated combat environment and will increase his confidence in using the computer in firing of service ammunition.</p>	<p>PE 100%</p>	<p>Live Fire 3 Ctg, HE, 105 per student.</p>	

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OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objective
<p>GD02AC - Preparation of Firing Charts Determination of Chart Data.</p> <p>Objective: Student will be able to construct a firing chart when given a grid sheet and plotting equipment and determine chart data to include range, deflection and azimuth to accuracies specified in FM 6-40 to designated locations on the chart.</p> <p>GD02AK - Firing Data (Elevation and Time)</p> <p>Objective: Student will be able to convert range to elevation and determine a fuze setting using graphical and/or tabular firing tables.</p>	<p>C 34% PE 66%</p> <p>C 20% PE 80%</p>	<p>Hands-on</p> <p>Hands-on</p>	<p>By demonstrating his knowledge of instructional material QD0202</p> <p>By demonstrating his knowledge of instructional material QD0202</p>

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OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Completed With C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GD02AT - Determination of Live Objective:</p> <p>Student will be able to determine site when given a GST and/or a TPT.</p>	<p>C 100%</p> <p>PE 100%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0202
<p>GD02AT - Operation of the Fire Direction Center.</p> <p>Objective:</p> <p>Student will be able to perform the prescribed duties of personnel in the fire direction center during area missions to include the use of fuze time and correctly complete the computer's record.</p>	<p>C 100%</p> <p>PE 80%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0202
<p>GD02TA - Operation of the Fire Fire Direction Center.</p> <p>Objective:</p> <p>Student will be able to perform the prescribed duties of personnel in the fire direction center during area missions.</p>	<p>PE 100%</p>	Live Fire 2.4 Proj, PE, 155/STUD.	By demonstrating his knowledge of instructional material GD0202

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OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GD02AZ - Precision Fire</p> <p>Objective: Student will be able to use the correct procedures to conduct an impact registration on a survey registration point and determine the adjusted elevation and deflection when given data from a completed registration.</p>	<p>C 34% PE 66%</p>		By demonstrating his knowledge of instructional material GD0203
<p>GD02BC - Precision Fire</p> <p>Objective: Student will be able to use the correct procedures to conduct a time registration and registrations for more than one lot of ammunition and be able to determine angle T.</p>	<p>C 27% PE 73%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0203
<p>GD02BH - Precision Fire</p> <p>Objective: Student will be able to validate and verify registrations and conduct destruction missions using procedures outlined in FM 6-60</p>	<p>C 27% PE 73%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0203

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OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD028L - Registration Corrections</p> <p>Objective:</p> <p>Student will be able to accurately determine range, deflection and fuze corrections when given chart data and adjusted data to a registration point.</p> <p>GD028U - Mean-Point-of-Impact, High-Burst and Radar Registrations.</p> <p>Objective:</p> <p>Student will be able to determine and apply registration corrections to firing data from a mean-point-of-impact, high-burst and radar registrations.</p>	<p>C 34%</p> <p>PE 66%</p>	<p>Hands-on</p>	<p>By demonstrating his knowledge of instructional material GD0203</p>
	<p>C 34%</p> <p>PE 66%</p>	<p>Hands-on</p>	<p>By demonstrating his knowledge of instructional material GD0203</p>

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FDC PROCEDURES TRAINING
OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD02TB - Registration Corrections from Impact, Time, High- Burst and Radar Registra- tions.</p> <p>Objective: Student will be able to conduct precision registration (to in- clude fuze time); conduct a high-burst and radar registra- tion; determine corrections from these registrations and apply the corrections to firing data. (Firing.)</p> <p>GD02CO - Computation of Metro Data</p>	<p>PE 100%</p>	<p>Live Firing 2.5 Proj, HE, 155/STUD.</p>	<p>By demonstrating his knowledge of instructional material GD0203</p>
<p>GD02CO - Computation of Metro Data</p> <p>Objective: Student will be able to accu- rately interpret a NATO met message and determine met, range and deflection corrections.</p>	<p>C 24% PE 76%</p>	<p>Hands-on</p>	<p>By demonstrating his knowledge of instructional material GD0204</p>

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OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD02CV - Velocity Error and Deflec- tion Corrections.</p> <p>Objective: Student will be able to compute VE and met fuze correction when given a NATO met message, DA Form 6-15, firing data and the appropriate TFI.</p>	<p>C 34%</p> <p>PE 66%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0204
<p>GD02DD - Fuze Corrections and 6400- Mil Firing Procedures</p> <p>Objective: Student will be able to deter- mine and apply met range de- flection and fuze corrections and compute and apply these corrections for 8-directional met techniques.</p>	<p>C 47%</p> <p>PE 53%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0204

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Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD02TC - Met and Velocity Error Corrections</p> <p>Objective: Student will be able to deter- mine and apply met range, de- flection and fuze corrections using the NATO met message dur- ing a firing exercise using the met + VE techniques. (Firing.)</p> <p>GD02DI - Fire Direction Center Team Drill and Special Missions</p> <p>Objective: Student will be able to super- vise FDC personnel in process- ing fire missions for fuze VT, aerial observers, TOT missions, shell smoke, shell illuminating, simultaneous multicabiler missions and techniques used in assault fire.</p>	<p>PE 100%</p> <p>C 18% PE 82%</p>	<p>Live Fire 2 Proj, HE, 155/ STUD.</p> <p>Hands-on</p>	<p>By demonstrating his knowledge of instructional material GD02TC</p> <p>By demonstrating his knowledge of instructional material GD0205</p>

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Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GDO2DU - High-Angle Fire Objective: Student will be able to describe high-angle fire techniques and the advantages and disadvantages of high-angle fire.</p> <p>GDO2GW - Position and Special Corrections. Objective: Student will be able to determine and apply position and special corrections to firing data to attack targets of nonstandard configuration.</p>	<p>50% C 47% PE</p> <p>20% C 74% PE</p>	<p>Hands-On</p> <p>Hands-On</p>	<p>By demonstrating his knowledge of instructional material GDO2DU</p> <p>By demonstrating his knowledge of instructional material GDO2GW</p>

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OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD02LQ - Gunnery Procedures for Nuclear Weapons Delivery with 8-Inch Howitzer.</p> <p>Objective: Student will be able to perform specific gunnery procedures for nuclear weapons delivery with the 8-inch howitzer.</p>	<p>C 42%</p> <p>PE 58%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0205
<p>GD02LZ - Gunnery Procedures for Nuclear Weapons Delivery with 155mm Howitzer.</p> <p>Objective: Student will be able to perform specific gunnery procedures for nuclear weapons delivery using the 155mm howitzer</p>	<p>C 36%</p> <p>PE 64%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0205

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OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GD02KN - Introduction to Gun Direction Computer M18 (FADAC) and Adjust Fire Missions.</p> <p>Objective: Student will be able to describe equipment, prepare computer for operation, operate controls, discuss program tapes, perform program tests, detail matrix functions, determine computer outputs, compute the ballistic trajectory, use the no-fire area subroutine and determine firing data under standard conditions. (Program Text.)</p>	<p>C 12% D 23% PE 65%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0207
<p>GD02KQ - Application of Met Corrections with FADAC</p> <p>Objective: Student will be able to compute VE with FADAC and use VE and met data in predicted fire, met message input procedures and special corrections.</p>	<p>C 27% D 24% PE 52%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0207

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Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD02KS - FADAC in Registrations</p> <p>Objective: Student will be able to apply registration corrections deter- mined from precision, time and HB/MPI registrations and apply registration corrections to nonregistering batteries.</p>	<p>C 24% D 24% PE 52%</p>	Hands-on	By demonstrating his knowledge of instructional material GD0207
<p>GD02TI - Fire Direction Center Team Drill</p> <p>Objective: Student will be able to apply procedures used in the FDC having both FADAC and manual means available. (Firing.)</p>	<p>PE 100%</p>	<p>Live Fire 4.2 Ctg, HE, 105/STUD</p>	By demonstrating his knowledge of instructional material GD0207

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Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD4EAT - Operation of the Fire Direction Center</p> <p>Objective: Student will be able to super- vise personnel in organization and operation of the FDC; duties of FDC personnel; complete FDC computer's record and properly determine various projectile- fuze combinations in area fire. (13 E only)</p>	<p>C 40%</p> <p>PE 60%</p>	Hands-on	By written examination GD4E01
<p>GD4EAZ - Precision Fire</p> <p>Objective: Student will be able to super- vise personnel in the conduct of precision fire, determination of adjusted elevation and de- flection. (13 E only)</p>	<p>C 30%</p> <p>PE 70%</p>	Hands-on	By written examination GD4E01

INCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD4EBC - Precision Fire</p> <p>Objective:</p> <p>Student will be able to super- vise precision fire, time registration, registration with two lots, destruction missions; determine validity of regis- trations and compute angle T. (13 E only).</p>	<p>C 33%</p> <p>PE 67%</p>	<p>Hands-on</p>	<p>By written examination GD4E01</p>
<p>GD4EBL - Registration Corrections (Range and Fuze)</p> <p>Objective:</p> <p>Student will be able to super- vise personnel in determining and applying total range and fuze corrections; rank K; and construct, determine and apply GFT settings. (13 E only)</p>	<p>C 35%</p>	<p>Hands-on</p>	

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Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objective:
<p>GD4EEP - Registration Corrections (Deflection)</p> <p>Objective: Student will be able to super- vise personnel in determining and applying total range and fuze corrections; range K; and construct, determine and apply GPT settings (13 E only)</p>	<p>C 35% PE 65%</p>	Hands-on	By written examination GD4E01
<p>GD4EBU - Mean-Point-of-Impact and High-Burst Registrations</p> <p>Objective: Student will be able to super- vise personnel in conducting mean-point-of-impact and high- burst registrations; trans- mitting message to observer and in the determination and applica- tion of HB/MPI registration corrections. (13 E only)</p>	<p>C 73% PE 37%</p>	Hands-on	By written examination GD4E01

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Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GD490V - Velocity Error and Met Deflection and Fuze Corrections.</p> <p>Objective: Student will be able to supervise personnel in the determination of VE, met fuze corrections, position deflection corrections, met plus VE GFI settings; and total deflection corrections from subsequent met messages (13 E only).</p> <p>GD4EDD - 8 - Directional Met Technique</p> <p>Objective: Student will be able to supervise personnel in the determination of met plus VE GFI settings and total deflection corrections using the 8-direction met technique. (13 E only)</p>	<p>C 25%</p> <p>PE 75%</p>	<p>Hands-on</p>	<p>By written examination of report</p>
	<p>PE 100%</p>	<p>Hands-on</p>	

FDC PROCEDURES TRAINING
NCO BASIC TRAINING

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GD4ETC - Met and Velocity Error Corrections</p> <p>Objective: Student will be able to supervise personnel in the operation of the FDC, determination and application of registration of corrections, determination of met corrections and VE, determination and application of met plus VE corrections. Firing exercise to include PADAC. (13 E only)</p>	PE 100%	Live Fire 2 Proj, HE, 155/STUD.	By written examination GD4E02
<p>GD4EGW - Position Corrections and Special Corrections.</p> <p>Objective: Student will be able to supervise personnel in the determination and application of position and special corrections (13 E only).</p>	C 40% PE 60%	Hands-on	

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NCO BASIC TRAINING

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD4EKN - Introduction to Gun Direc- tion Computer M18 (FADAC) and Observer Adjusted Fire Missions.</p> <p>Objective: Student will be able to super- vise personnel in preparation of FADAC for operation; learn operator controls, program tapes, tests, detailed matrix functions, computer output; and be able to use the FADAC to com- pute the ballistic trajectory, no-fire area sub-routine, and determine firing data with FADAC considering standard conditions. Programmed text. (13 E only)</p>	<p>C 20% D 20% PE 60%</p>	<p>Hands-on</p>	<p>By written examination GD4E02</p>

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NCO BASIC TRAINING

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD4EEQ - Application of Met Corrections with FADAC.</p> <p>Objective:</p> <p>Student will be able to supervise personnel in the computation of VE with FADAC, the use of VE and met data in predicted fire, the input of met messages and special situations. (13 E only)</p>	<p>C 17%</p> <p>D 17%</p> <p>PE 66%</p>	<p>Hands-on</p>	
<p>GD4EKS - FADAC in Registrations</p> <p>Objective:</p> <p>The student will be able to supervise personnel in applying registration corrections determined from precision, time and HB/MPI registrations and the application of registration corrections to nonregistering batteries. (13 E only).</p>	<p>C 26%</p> <p>PE 74%</p>	<p>Hands-on</p>	<p>By practical examination GD4E04</p>

FIELD ARTILLERY

FDC PROCEDURES TRAINING

NGO BASIC TRAINING

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>GD4EEM - The Observed Firing Chart.</p> <p>Objective:</p> <p>The student will be able to supervise personnel in the construction of the observed firing chart (percussion and time plot) and in the construction of firing charts with limited survey. (13 E only)</p>	<p>C 26%</p> <p>PE 74%</p>	Hands-on	
<p>GD4EFG - Transfer from the Observed Firing Chart to the Surveyed Firing Chart.</p> <p>Objective:</p> <p>The student will be able to supervise personnel in transferring from the OF chart to a surveyed firing chart (13 E only).</p>	<p>C 50%</p> <p>PE 50%</p>	Hands-on	

FIELD ARTILLERY
FDC PROCEDURES TRAINING
NCO BASIC TRAINING

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GD4ELE - 155mm Howitzer Nuclear Delivery Procedures.</p> <p>Objective:</p> <p>The student will be able to supervise personnel in FDC pro- cedures for nuclear weapon de- livery with the 155mm howitzer. (13 E only).</p>	<p>C 50%</p> <p>PE 50%</p>	<p>Hands-on</p>	
<p>GD4ELQ - 8-Inch Howitzer Nuclear Delivery Procedures.</p> <p>Objective:</p> <p>Student will be able to super- vise personnel in FDC procedures for nuclear weapon delivery with the 8-inch howitzer. (13 E only)</p>	<p>C 26%</p> <p>PE 74%</p>		

FIELD ARTILLERY

FDC PROCEDURES TRAINING

NCO ADVANCE COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PF.	Utilization of Training Devices, Live Firings, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objective.
<p>GFD970 - Fire Direction Procedures (GD35CC)</p> <p>Objective: The student will be able to pre- pare a firing chart, compute site, utilize the GFT, and correctly fill in a computers record.</p> <p>GFD142 - Registrations Corrections Shoot (GD35CC)</p> <p>Objective: The student will be capable of conducting precision fire and time registrations to include determination and application of range and deflection corrections as well as transfer of fire with registration corrections, MPI and HB.</p>	<p>C 60% PF 40%</p> <p>PE 100%</p>	<p>Hands-on</p> <p>Live Fire 2.5 Proj, HE, 155/ STUD.</p>	<p>By written examination GD35LK</p>

FIELD ARTILLERY

FDC PROCEDURES TRAINING

NCO ADVANCE COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GFD202 - Met and Velocity Error Corrections (GD35DF)</p> <p>Objective: The student will be able to determine and apply VE and de- flection corrections with met message.</p>	<p>PE 100%</p>	<p>Live Fire 2 Proj, HF, 155/STUD.</p>	<p>By written examination GD35LK</p>
<p>GFD730 - Introduction and Familiar- ization with FADAC (GD35KU)</p> <p>Objective: The student will be capable of discussing the characteristic and function of FADAC. Student will also be capable of enter- ing data for solution of various gunnery problems.</p>	<p>C 40% PE 60%</p>	<p>Hands-on</p>	<p>By written examination GD35LK</p>

FIELD ARTILLERY

OBSERVED FIRE TRAINING

AIT 13 E 20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p><u>Observed Fire and Fire Support Operations.</u> To teach the trainee the duties or the forward observer, the methods of locating targets, the elements of the call for fire and subsequent corrections, the procedures for and adjustment of field artillery fire in area and precision missions.</p> <p><u>Period 1.</u> Duties of the forward observer and target location</p> <p>(a) <u>Training objective.</u> The trainee will be able to locate targets by using a map and observer equipment and will know the general duties of the forward observer in his occupation of an observation post.</p>	<p>L 13% D 37% PE 50%</p>	<p>Hands-on</p>	

OBSERVED FIRE TRAINING

AIT 13 E 20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p><u>Period 2. Adjustment of field artillery fire and the effects of ammunition.</u></p> <p>(a) <u>Training objective.</u> The trainee will be able to use the correct procedures for adjusting field artillery fire. He will be familiar with the effects of exploding field artillery ammunition on targets.</p>	<p>L 21% D 42% PE 37%</p>	<p>Hands-on</p>	
<p><u>Period 3. Field artillery team in action.</u></p> <p>(a) <u>Training objective.</u> The trainee will know the elements of the field artillery team, their general real responsibilities, and how they work together as a team.</p>	<p>D 100%</p>	<p>Live Fire 10 Ctg, HE, 105/ Demo. 6 Ctg, SMK, 105/ Demo.</p>	

FIELD ARTILLERY

OBSERVER FIRE TRAINING

AIT 13 E 20

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock-Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>Period 12. Conduct of area fire-field exercise.</p> <p>(a) <u>Training objective.</u> The trainee will develop proficiency in the duties of FDC and FO personnel in the execution of area fire missions in which live ammunition is used.</p>	<p>Field Exercise (This period also related in FDC training)</p>	<p>Live Fire (See Period 12, FDC Training, AIT 13 E 20)</p>	

FIELD ARTILLERY

OBSERVED FIRE TRAINING OFFICERS BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>G002AA - Duties of the Observer and Target Location</p> <p>Objective: Student will be able to locate a target using one of the principal methods (polar plot, shift from known point, grid coordinates) when given a map, binoculars, OF fan and known point data and describe a laser rangefinder.</p>	<p>C 12% TV 18% PE 70%</p>	Hands-on	By demonstrating his knowledge of instructional material covered G00201
<p>G002AC - Call for Fire and Terminal Effects of Ammunition.</p> <p>Objective: Student will be able to initiate a correct call for fire when given pertinent target data and be able to analyze and attack a target given a target descrip- tion, pertinent fire support media, ammunition and terrain features surrounding the target.</p>	<p>C 50% PE 50%</p>	Hands-on	By demonstrating his knowledge of instructional material covered G00201

FIELD ARTILLERY
OBSERVED FIRE TRAINING
OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercises or Demonstration.	Percentage of Period Computed with C, P, or PE.	Utilization of Training Devices, Live Firing, Mock- Up, or Hands-On Actual Equipment During PI.	Method of Measuring Attain- ment of Course Objectives.
<p>G002AK - Alignment of Fire</p> <p>Objective: Student will be able to align artillery fire to within 10 meters of a designated adjust- ing point and adjust height of burst to within 5 meters of the optimum HOP (50 meters).</p>	<p>C 7%</p> <p>PE 14%</p> <p>PE 79%</p>	Hands-On	By demonstrating his knowledge of instructional material covered G002AK
<p>G002AQ - Control of Fire</p> <p>Objective: Student will be able to prepare to observe an artillery fire when given a standard equipment ment; prepare a correct call for fire; spot bursts rapidly; re- quest subsequent fire and report surveillance for area, precision and special missions.</p>	<p>C 50%</p> <p>PE 50%</p>	Hands-On	By demonstrating his knowledge of instructional material covered G002AQ

FIELD ARTILLERY

OBSERVED FIRE TRAINING OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercises or Demonstration.	Percentage of Period Contained With G, M, or P.	Utilization of Training Devices, Live Firing, Mock- ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GO0001 - Course - P.E.</p> <p>Objectives:</p> <p>Students will be able to identify artillery fire in specific types of fire missions (i.e., from an aerial platform and with aerial field artillery.</p> <p>GO0002 - Service Practice (Continued)</p> <p>Objectives:</p> <p>Students will be able to observe area and precision fire missions given a 1:1.5-1 stainer and an administrative CP.</p>	<p>100%</p>	<p>100% Live Firing</p>	<p>By observation of the results of of instruction. For the GO0001</p>
<p>GO0003 - Service Practice (Continued)</p> <p>Objectives:</p> <p>Students will be able to observe area and precision fire missions given a 1:1.5-1 stainer and an administrative CP.</p>	<p>100%</p>	<p>100% Live Firing</p>	<p>By observation of the results of of instructional material. For the GO0002</p>

FIELD ARTILLERY

OBSERVED FIRE TRAINING

OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercises or Demonstration.	Percentage of Total Instructional Time	Utilization of Training Devices, Live Firing, Mock-Up, or Hands-On Actual Equipment During PE.	Method of Measuring Attainment of Course Objectives.
<p>* G002SB - Survive Practice</p> <p>G002SE</p> <p>* G002SJ</p> <p>* G002SR</p> <p>* G002ST</p> <p>** G002SY</p> <p>Objective:</p> <p>Student will be able to use the correct procedures to adjust artillery fire to within 50 meters of a designated adjusting point and within 5 meters of the optimum height (20 meters) from an administrative ground OP and from an aerial platform.</p> <p>*Simultaneous training with CED and FDC will be conducted.</p> <p>**Simultaneous training with the 14.5 mm will be conducted.</p>	PE 100%	<p>Live Fire</p> <p>250 Cts, 14.5/PE</p> <p>30.2 Cts, HE,</p> <p>107/STUD</p> <p>6 Proj, HE,</p> <p>155/STUD</p>	<p>By demonstrating his knowledge of instructional material covered G00201</p>

FIELD ARTILLERY

OBSERVED FIRE TRAINING

OFFICER BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>2TG - Shell Reports, Crater and Fragment Analysis</p> <p>Objective: The student will perform a crater and fragment analysis to determine the azimuth, the type, and caliber of weapon and record all results on DA Form 2185-p (ACIF) for sub- mission of the appropriate re- port.</p>	<p>TV 15% PE 85%</p>	<p>Live Fire .33 Ctg, HE, 4.2/STUD 40 Ctg, HE, 4.2/PE .33 Ctg, HE, 105/STUD 40 Ctg, HE, 105/PE</p>	

FIELD ARTILLERY

OBSERVED FIRE TRAINING

NCO BASIC COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Contained with C, D, or E.	Utilization of Training Devices, Live Firing, Mock- ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>G040S2 - Service Practice</p> <p>Objective:</p> <p>Student will be able to adjust fire using the 1:50 trainer.</p>	<p>Live Fire 12 1/2 STIM Training Device (14.5)</p>		

FIELD ARTILLERY

OBSERVED FIRE TRAINING

NCO ADVANCE COURSE

Period and Scope of Instruction Containing Practical Exercise or Demonstration.	Percentage of Period Conducted with C, D, or PE.	Utilization of Training Devices, Live Firing, Mock- Ups, or Hands-On Actual Equipment During PE.	Method of Measuring Attain- ment of Course Objectives.
<p>GB35NC - Duties of the Executive and other firing battery personnel in firing/observed fire procedures.</p> <p>Objective: The student will perform the duties of firing section personnel and observers (splitshoot).</p> <p>TA5054 - Target Acquisition and Combat Surveillance Systems Operations</p> <p>A035AZ</p> <p>Objective: Provided two AN/MPQ-4A, one AN/TPS-25A, one AN/TPS-58 radar sets, one AN/GVS-3 laser range finder, unattended ground sensors, one helicopter, and 1-105mm howitzer with 50 rounds ammunition and fire direction center, the student will be able to identify the target acquisition and combat surveillance devices and cite the capabilities and limitations of the devices and cite the missions and employment of the devices with 70% accuracy.</p>	<p>This period also reflected in 155 Howitzer Training</p> <p>D 100%</p>	<p>Live Fire (See period GB35NC, 155 Howitzer Training, NCO Advance)</p> <p>Live Fire 50 Ctg, HE, 105/PE</p>	

APPENDIX G

AIR DEFENSE, BRIEF SURVEY

M4. DUSTER

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		58		
Demonstration				
Practical Exercise		222		
Peer Instruction				
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: Examination				
Total Hours of Instruction		280		

AIR DEFENSE

M42 DUSTER

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device				
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures		30		
Printed Material				
Television				
Motion Pictures				
Actual Equipment		250		
Instructor				
Other _____				

AIR DEFENSE

M42 DUSTER

Practical Exercises	Amount of Practice (Rounds)			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				
INDIVIDUAL DRILL				
Live Fire		32		
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				

AIR DEFENSE

M42 DUSTER

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100		
Type of Evaluation				
Paper and pencil				
Hands On, Part Task		40		
Performance With Training Devices				
Crew Drill, Gunner's Test		60		
Integrated Test of Terminal Per- formance require- ment				
Qualification				

AIR DEFENSE

M42 DUSTER

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1-6		
Time Period Over Which Instruc- tion Is Scheduled		7 wks		
Total Hours Allo- cated For Course		280		
Hours For Training		262		
Hours For Evalua- tion		18		

AIR DEFENSE

VULCAN

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		56		
Demonstration				
Practical Exercise		165		
Peer Instruction				
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study		As Directed		
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: <u>Admin</u>		46		
Total Hours of Instruction		267		

AIR DEFENSE

VULCAN

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips		3		
Training Device		28		
Audio Tape Rcrds		1		
Transparencies				
Filmstrips				
Still Pictures				
Printed Material				
Television				
Motion Pictures				
Actual Equipment				
Instructor		235		
Other _____				

AIR DEFENSE

VULCAN

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				
INDIVIDUAL DRILL				
Live Fire		300*		
Ball		260**		
Tracer		60***		
Simulated Fire				
Blank				
Dry Fire				

*Rounds, Aerial Targets

**Rounds, Target Practice Tracer (TP-T)

***Rounds, Ground Targets

AIR DEFENSE

VULCAN

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100		
Type of Evaluation				
Paper and pencil				
Hands On, Part Task				
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal per- formance require- ment		100		
Qualification				

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AIR DEFENSE

VULCAN

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:6		
Time Period Over Which Instruction Is Scheduled		7 wks		
Total Hours Allocated For Course		280		
Hours For Training		208		
Hours For Evaluation		17		

AIR DEFENSE

REDEYE

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		9		
Demonstration		1		
Practical Exercise		31		
Peer Instruction				
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Examination		2		
Other: Critique		1		
Total Hours of Instruction		44*		

*44 of 83 hours considered to be directly concerned with Gunner Training.

AIR DEFENSE

REDEYE

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips		2*		
Training Device		59		
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures				
Printed Material				
Television				
Motion Pictures		26**		
Actual Equipment		2***		
Instructor				
Other _____				

*Range Firing
 **MTS Trainer
 ***Range Firing

AIR DEFENSE

REDEYE

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				
INDIVIDUAL DRILL				
Live Fire (Gunner)		2*		
Ball				
Tracer				
Simulated Fire (Gunner)		156**		
Blank				
Dry Fire				

*Rounds per class

**Trials

AIR DEFENSE

REDEYE

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100		
Type of Evaluation				
Paper and pencil		60		
Hands On, Part Task				
Performance With Training Devices		40		
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification				

AIR DEFENSE

REDEYE

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee			
	BCT	AIT	BUT	AUT
Evaluation of Firing Proficiency				
Crew Performance				
Live Fire				
Simulated Fire				
Dry Fire				
Individual Perform- ance				
Live Fire (Gunner)		2*		
Simulated Fire (Gunner)		10*		
Dry Fire				

*Per Class

**Trials

AIR DEFENSE

REDEYE

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:6		
Time Period Over Which Instruction Is Scheduled		3 wks		
Total Hours Allocated For Course		120		
Hours For Training		83 Total*		
Hours For Evaluation		2		

*44 Direct Gunner Training

AIR DEFENSE

CHAPARRAL

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		6		
Demonstration				
Practical Exercise		33*		
Peer Instruction		33*		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: <u>Examination</u>				
Total Hours of Instruction		39		

*Same Periods

AIR DEFENSE

CHAPARRAL

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips		8*		
Training Device		8*		
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures				
Printed Material				
Television				
Motion Pictures				
Actual Equipment		33		
Instructor				
Other _____				

*Used with actual equipment.

AIR DEFENSE

CHAPARRAL

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire		6		
INDIVIDUAL DRILL				
Live Fire		1*		
Ball				
Tracer				
Simulated Fire		16		
Blank				
Dry Fire				

*Live Round Per Class

AIR DEFENSE

CHAPARRAL

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100		
Type of Evaluation				
Paper and pencil				
Hands On, Part Task		100*		
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification				

*Peer Testing

AIR DEFENSE

CHAPARRAL

End of Course Proficiency Measurement	Number of Test Trials or Rounds Per Trainee			
	BCT	AIT	BUT	AUT
Evaluation of Firing Proficiency				
Crew Performance				
Live Fire				
Simulated Fire				
Dry Fire				
Individual Perform- ance				
Live Fire		1*		
Simulated Fire		16**		
Dry Fire				

*Per Class

**Instructor checks tracking ability.

AIR DEFENSE

CHAPARRAL

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:1*		
Time Period Over Which Instruction Is Scheduled		7 wks		
Total Hours Allocated For Course		280		
Hours For Training		220 Total		
Hours For Evaluation		***		

*On Peer Instruction

**39 Gunner Related

***Continuous in Peer Instruction

AIR DEFENSE

HAWK

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		15		
Demonstration		48		
Practical Exercise		58		
Peer Instruction				
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: <u>Performance Tests</u>		33		
Total Hours of Instruction		154		

AIR DEFENSE

HAWK

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device				
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures				
Printed Material				
Television				
Motion Pictures		11		
Actual Equipment		106		
Instructor				
Other _____				

AIR DEFENSE

HAWK

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire		*		
Blank				
Dry Fire				
INDIVIDUAL DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				

*Rotate through all fire control positions.

AIR DEFENSE

HAWK

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100		
Type of Evaluation				
Paper and pencil				
Hands On, Part Task				
Performance With Training Devices				
Crew Drill, Gunner's Test		40		
Integrated Test of Terminal Per- formance require- ment		60		
Qualification				

AIR DEFENSE

HAWK

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:6		
Time Period Over Which Instruction Is Scheduled		7 wks		
Total Hours Allocated For Course				
Hours For Training		144		
Hours For Evaluation		83		

AIR DEFENSE

HERCULES

Instructional Method	Hours of Instruction For Each Level of Training			
	BCT	AIT	BUT	AUT
Lecture				
Conference		14		
Demonstration		39		
Practical Exercise		129		
Peer Instruction		*		
Instructor Guidance and Critique With Small Group				
Individualized (self paced)				
Group Paced				
Self Study				
Guest Speaker				
Case Study				
Seminar				
Computer Assisted Instruction				
Programmed Instruction				
Other: <u>Examination</u>				
Total Hours of Instruction		182		

*Throughout most of the PEs.

AIR DEFENSE

HERCULES

Instructional Media	Hours of Instruction Conducted With Various Media			
	BCT	AIT	BUT	AUT
Field Trips				
Training Device				
Audio Tape Rcrds				
Transparencies				
Filmstrips				
Still Pictures				
Printed Material				
Television				
Motion Pictures		10		
Actual Equipment		172		
Instructor				
Other _____				

AIR DEFENSE

HERCULES

Practical Exercises	Amount of Practice			
	BCT	AIT	BUT	AUT
CREW DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire		*		
Blank				
Dry Fire				
INDIVIDUAL DRILL				
Live Fire				
Ball				
Tracer				
Simulated Fire				
Blank				
Dry Fire				

*Rotate through all fire control positions.

AIR DEFENSE

HERCULES

End of Course Proficiency Measurement	Percent of Total Evaluation			
	BCT	AIT	BUT	AUT
Type of Measure				
Norm Referenced (curve)				
Criterion Referenced (go/no go)		100		
Type of Evaluation				
Paper and pencil				
Hands On, Part Task		100*		
Performance With Training Devices				
Crew Drill, Gunner's Test				
Integrated Test of Terminal Per- formance require- ment				
Qualification				

*Separate test at end of each equipment portion of training.

AIR DEFENSE

HERCULES

Training Management Considerations	BCT	AIT	BUT	AUT
Prescribed Inst/ Stu. Ratio		1:6		
Time Period Over Which Instruction Is Scheduled		8 wks		
Total Hours Allocated For Course		241 (MOS)		
Hours For Training		182		
Hours For Evaluation		59		

AIR DE 'ENSE

Army Training Test - Unit Training

[illegible]

Number of Test Trials or Rounds Per Trainee

[illegible]

AIR DEFENSE

Operational Readiness Training Test - Unit Training

Proficiency Measurement	Percent of Total Evaluation					
	M42 Duster	Vulcan	Redeye	Chaparral	Hawk	Hercules
Type of Measure						
Norm Referenced						
Criterion Referenced	-	100		Must meet minimum requirement	100	100
Evaluation of Firing Proficiency	Number of Test Trials or Rounds Per Trainee					
Crew Performance						
Live Fire	National Guard Only	2100 per crew		1	1 during ASP	
Simulated Fire						
Dry Fire						
Individual Performance						
Live Fire						
Simulated Fire						
Dry Fire						

AIR DEFENSE

Facilities & Fiscal Sup- port Training	WEAPON SYSTEMS					
	M42 Duster	Vulcan	Redeye	Chaparral	Hawk	Hercule
Weapon Cost						
Initial	92,821	276,377	5,400	278,449	2512,626	2,396,2
Weapon or Barrel Life In Terms of Rounds						
Ammunition Cost Per Round						
Ball				11,649 (MIM-72A)		39,8
Tracer	5.84	1.33 (TP-T)				
Blank						
Approximate Sizes of Ranges Required For Training						
Tactical Exer- cises (maneu- vers)						
Live Firing				85 sq.miles	608 sq. miles	
Number of Support Personnel Required For Live Firing			350 sq. miles	350 sq.miles	350 sq. miles	
Direct						
Target Acqui- sition						
Communication						
Indirect						
Range Support						
Medical						

DESCRIPTION OF TRAINING DEVICE FOR THE
REDEYE

Level of Training	MOS Suffix R6 awarded to graduates
Title and Nomenclature of Training Device	M87 Moving Target Simulator
Description of Training Device	The M87 is a device which projects realistic aircraft target images, flight patterns, and maneuvers on a simulated sky background extending 180° in azimuth and 90° in elevation. Target sound effects and a painted background add realism. An invisible inferred spot coincident with the target position provides feedback for the Redeye infrared seeker. The M49 Tracking Head Trainer is used to engage targets presented on the M87 MTS. Various types of targets can be presented on the M87 to provide identification training on low or high speed aircraft.
<p>Course of Instruction Utilizing Training Device</p> <p>Title</p> <p>Total Number of Hours</p> <p>Number of Instructional Hours Scheduled for Training Device</p> <p>Total Amount of Time Each Trainee User Device</p> <p>Phase, Period, or Block of Course Where Device is Used</p>	<p>30 Hours</p> <p>26 Hours *</p> <p>Period 8</p>
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	<ol style="list-style-type: none"> 1. Detect and identify aircraft 2. Practice sighting, ranging, and tracking 3. Obtain feedback for IR seeker from IR source 4. Evaluate proficiency of gunners.

* During the 26 hour PE portion of this period the trainees are either engaging projected aircraft with the M49, coaching M49 firer, using an optical sight to track the aircraft or observing the firers performance. Actual M49 Time - 4 hours.

Percentage of Total Firing Practice for the Weapon Conducted with the Following: Training Device Live Firing Dry Firing Other	 100
Training Device Costs Cost of Each Device Number of Devices Required per Course Expected Life of Device Maintenance Costs Per Year Cost Per Round (Where Appropriate)	 \$350,000. 2

NOTE: The M87 is also used periodically by a Redeye Section for Unit Refresher Training.

DESCRIPTION OF TRAINING DEVICE FOR THE
REDEYE

Level of Training	(MOS Suffix R6 awarded to graduates)
Title and Nomenclature of Training Device	M46 Field Handling Trainer
Description of Training Device	The M46 is a Full-Scale Weapon launcher similar in external appearance, weight, and feel to the tactical weapon. It is a rugged inexpensive device which provides the gunner practice in weapon handling, operation, sighting, and ranging. Controls and mechanical operations are the same as the real weapon but it contains no electronic equipment.
Course of Instruction Utilizing Training Device	
Title	Redeye Gunner
Total Number of Hours	83
Number of Instructional Hours Scheduled for Training Device	2 Hours
Total Amount of Time Each Trainee Uses Device	25 Minutes
Phase, Period, or Block of Course Where Device is Used	Period 6
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	<p>A. The Gunner uses the range ring to acquire the target.</p> <p>B. Operates controls to activate and uncage gyro.</p> <p>C. Superelevates and applies appropriate lead</p> <p>D. Fires at appropriate time</p>

Note: This device has no power so there is no IR tone feedback.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>25</p>

DESCRIPTION OF TRAINING DEVICE FOR THE
REDEYE

Level of Training	Unit Training
Title and Nomenclature of Training Device	M46 Field Handling Trainer
Description of Training Device	The M46 is a full-scale weapon launcher similar in external appearance, weight, and feel to the tactical weapon. It is a rugged inexpensive device which provides the gunner practice in weapon handling, operation, sighting, and ranging. Controls and mechanical operations are the same as the real weapon but it contains no electric equipment.
Course of Instruction Utilizing Training Device	
Title	Air Defense Section Training
Total Number of Hours	264 hours listed in Subj Schd 23-17 (actual hours minimal)
Number of Instructional Hours Scheduled for Training Device	
Total Amount of Time Each Trainee Uses Device	
Phase, Period, or Block of Course Where Device is Used	Periodic refresher training
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	<p>A. The Gunner uses the range ring to acquire the target.</p> <p>B. Operates controls to activate and uncage gyro.</p> <p>C. Superelevates and applies appropriate lead</p> <p>D. Fires at appropriate time</p>

NOTE: This device has no power so there is no IR tone feedback.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%[*]</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>One Per Redeye Team</p>

^{*} No live fire

**DESCRIPTION OF TRAINING DEVICE FOR THE
REDEYE**

Level of Training	
Title and Nomenclature of Training Device	M49 Tracking Head Trainer
Description of Training Device	This Trainer is similar to Redeye System in weight, size, and positioning of the controls and handling characteristics. Except for firing, it simulates the operation of the weapon. An externally mounted performance indicator permits the instructor to evaluate the operator's performance. The M49 is approximately 49½ inches in length, 14 inches in height, and weighs 32 pounds.
Course of Instruction Utilizing Training Device Title Total Number of Hours Number of Instructional Hours Scheduled for Training Device Total Amount of Time Each Trainee Uses Device Phase, Period, or Block of Course Where Device is Used	Redeye Gunner 83 Hours 31 Hours 6 Hours Periods 5, 6, 8, and 16
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	The Gunner (1) prepares the weapon for firing, (2) practices visual tracking and ranging using sight, (3) tracks aircraft and activates the weapon at the appropriate time, (4) uncages the gyro and checks for proper IR tone, (5) superelevates and applies appropriate lead, (6) fires at appropriate time, (7) checks performance indicator for any errors in procedure.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>\$11,000. *</p> <p>25</p> <p>Currently 5-6 years old</p>

*The M49 is part of the M76 Training Set which costs \$16,000.

**DESCRIPTION OF TRAINING FOR THE
REDEYE**

Level of Training	Unit Training
Title and Nomenclature of Training Device	M49 Tracking Head Trainer
Description of Training Device	This Trainer is similar to Redeye System in weight, size, and positioning of the controls and handling characteristics. Except for firing, it simulates the operation of the weapon. An externally mounted performance indicator permits the instructor to evaluate the operator's performance. The M49 is approximately 49½ inches in length, 14 inches in height, and weighs 32 pounds.
Course of Instruction Utilizing Training Device	
Title	Air Defense Section Training
Total Number of Hours	264 hours listed in Subj Schd 23-17 (actual hours minimal)
Number of Instructional Hours Scheduled for Training Device	
Total Amount of Time Each Trainee Uses Device	
Phase, Period, or Block of Course Where Device is Used	Periodic Refresher Training
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	The Gunner (1) prepares the weapon for firing, (2) practices visual tracking and ranging using sight, (3) tracks aircraft and activates the weapon at the appropriate time, (4) uncages the gyro and checks for proper IR tone, (5) superelevates and applies appropriate lead, (6) fires at appropriate time, (7) checks performance indicator for any errors in procedure.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	<p>100 *</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	<p>\$11,000</p> <p>One per section</p>

* No live fire

DESCRIPTION OF TRAINING DEVICE FOR
CHAPARRAL

Level of Training	Advance Individual Training
Title and Nomenclature of Training Device	M30 Training Missile with MK28 Guidance Section.
Description of Training Device	The Chaparral is a self-propelled, surface-to-air guided missile system. It has a launch station (M54) which may be mounted on or separate from its tracked carrier vehicle (M730). It fires a missile (MLM-72A) that is supersonic and uses passive infrared target tracking. The missile is 9.5 feet long, 5 inches in diameter and weighs 180 pounds. Four missiles are mounted on the launch rails.
Course of Instruction Utilizing Training Device Title Total Number of Hours Number of Instructional Hours Scheduled for Training Device Total Amount of Time Each Trainee Uses Device Phase, Period, or Block of Course Where Device is Used	Chaparral MOS 16 P 10 280 8 2 Period 32
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	1. Acquiring the target 2. Tracking the target 3. Preparing weapon for firing 4. Simulated firing on target

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other Crew Drill-Operating Controls</p>	<p>20%</p> <p>5%</p> <p>75%</p>
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

DESCRIPTION OF TRAINING DEVICE FOR THE

HAWK

Level of Training	Advance Individual Training
Title and Nomenclature of Training Device	TPQ - 21 Target Simulator
Description of Training Device	Electronic equipment housed in a van used to insert simulated targets and chaff into conventional HAWK fire control radar scopes.
Course of Instruction Utilizing Training Device	
Title	Hawk Fire Control Crewman
Total Number of Hours	144 (MOS)
Number of Instructional Hours Scheduled for Training Device	Variable*
Total Amount of Time Each Trainee Uses Device	Variable*
Phase, Period, or Block of Course Where Device is Used	
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	<ol style="list-style-type: none"> 1. Acquiring targets 2. Tracking targets 3. Electronic counter-counter-measures

* These simulators are used during a brief operation and ECCM portion of the course. Trials depends upon size of class and interference from other systems. Crowded radar park makes it difficult to provide students with normally uncluttered scopes.

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

DESCRIPTION OF TRAINING DEVICE FOR THE
HAWK

Level of Training	Advance Individual Training
Title and Nomenclature of Training Device	TPQ 29 Target Simulator
Description of Training Device	Same as TPQ 21, but used with Improved HAWK.
Course of Instruction Utilizing Training Device	
Title	HAWK Fire Control Crewman
Total Number of Hours	144
Number of Instructional Hours Scheduled for Training Device	
Total Amount of Time Each Trainee Uses Device	
Phase, Period, or Block of Course Where Device is Used	
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	<ol style="list-style-type: none"> 1. Target acquisition 2. ECCM

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate) ,</p>	

DESCRIPTION OF TRAINING DEVICE FOR THE

HERCULES

Level of Training	Advance Individual Training
Title and Nomenclature of Training Device	T 1 Target Simulator
Description of Training Device	Same as TPQ - 21, but used with NIKE HERCULES.
<p>Course of Instruction Utilizing Training Device</p> <p>Title</p> <p>Total Number of Hours</p> <p>Number of Instructional Hours Scheduled for Training Device</p> <p>Total Amount of Time Each Trainee Uses Device</p> <p>Phase, Period, or Block of Course Where Device is Used</p>	<p>NIKE HERCULES Fire Control Crewman</p> <p>241 (MOS)</p>
Skills, Functions, Decision Processes, or Computational Procedures Practiced with Training Device	<p>Target acquisition</p> <p>Tracking</p> <p>ECCM</p>

<p>Percentage of Total Firing Practice for the Weapon Conducted with the Following:</p> <p>Training Device</p> <p>Live Firing</p> <p>Dry Firing</p> <p>Other</p>	
<p>Training Device Costs</p> <p>Cost of Each Device</p> <p>Number of Devices Required per Course</p> <p>Expected Life of Device</p> <p>Maintenance Costs Per Year</p> <p>Cost Per Round (Where Appropriate)</p>	

APPENDIX H

AIR DEFENSE

DESCRIPTION OF AIT WEAPONS TRAINING

FOR THE REDEYE

INTRODUCTION

DESCRIPTION OF WEAPON SYSTEM

The Redeye is a mm-portable, shoulder-fired, air defense guided missile system. It is a tube approximately 50 inches long and 4.7 inches in diameter with a handle, trigger, and sight attached to the forward end. The complete system weighs 28.9 pounds, and consists of three major components, the launcher, missile, and battery/coolant unit.

The Redeye launcher has three main sections, the launch tube, open sight assembly, and gripstock. The launch tube houses the missile which is pre-loaded by the manufacturer and cannot be reloaded by the operator. The open sight assembly is used to aim the weapon, track the target, estimate the range to the target, and insert super-elevation lead. The sight also has an acquisition indicator which provides an audible and vibratory indication when the missile system has acquired the target. The gripstock contains the controls and power and coolant channels necessary to launch the missile. The controls consist of the safety and activator device, uncaging switch, and firing trigger. The electrical power required to condition the weapon for firing is supplied by a thermal battery which can provide prelaunch power for 30 seconds. The coolant portion of the battery/coolant unit provides freon gas to cool the detector cell thus making it supersensitive to infrared radiation.

The Redeye is a supersonic, surface-to-air rocket propelled passive infrared homing, heat seeking missile. It has six major

sections: seeker, control, missile battery, fuze and warhead, rocket motor and tail assembly. The missile warhead is detonated in one of three ways: by penetrating the metal surface of the target, by impact with the target, and by self-destruct after approximately 15 seconds of flight.

The gunner operates the weapon by placing it on his shoulder pointing it at a visually acquired aircraft target, tracking the target to maintain an on-target tone which indicates that the infrared seeker head in the missile had acquired the target, pressing and holding the switch that uncages the missile gyro, manually inserting superelevation and lead, and pressing the firing trigger. Once fired, the missile is beyond the gunners control and depends upon the targets infrared radiations to generate guidance orders.

TACTICAL MISSION

The mission of Redeye is to provide small combat units the forward battle area with a self-defense capability against attack by aircraft operations at low altitudes. Redeye is used in three types of defense: area, point, and march column. In area defense the Redeye terms are deployed to defend an operating area, e.g., battalion area. In point defense, Redeye is deployed to defend a small vital area such as a command post, an ammunition supply point, an airfield, etc. Redeye provides air defense for a march column by either being placed along the route of displacement or by moving with the column.

CURRENT ARMY ORGANIZATION OF WEAPONS AND PERSONNEL

Redeye is organic to battalions or squadrons of armored, airborne, airmobile, infantry and mechanized infantry divisions of the field army. It is also assigned to nondivisional units such as separate brigades,

designing the moving target simulator (MTS) target programs and the rules of engagement. Specification of the engagement procedures was based on the operating characteristics of the weapon, individual simulation, observation, and interviews with gunners who participated in the service and site tests.

UTILIZATION OF PROFILES

Other than the information listed in A above, no known mission profiles were used in the development of the Redeye.

AMOUNT OF TRAINING REQUIRED FOR PROFICIENCY

The service and site tests mentioned above were also the basis for the requirement for 150 practice engagement trials of attain gunner proficiency. One hundred-twenty of these trials were allocated to the MTS and thirty to tracking of live targets. The recent deletion of live aircraft support due to the gas shortage has resulted in a revision of this training. Current training requires 156 trials per individual on the MTS and none on live aircraft. A combination of instructor observation of performance and periodic examinations evaluate the students progress during the course. A study hall is conducted two nights a week for students falling below a 70 percent is required for successful completion of the course and adding the 6R prefix (Redeye Gunner) to the individuals MOS.

TRAINING METHODS

This section is limited to those periods of instruction which were considered to have direct application to the trainees practice of some aspect of the firing sequence. Appropriate periods are described below and a further breakout of hours and type of instruction is listed in Table H-1.

PERIOD 1 - During this period, the trainee is introduced to the Redeye weapon's characteristics, system capabilities, and major system components. This is basic information the gunner must know to prepare him for later application periods.

PERIOD 5 - During this period, the trainee is given an explanation of the Redeye system, observes a demonstration of the M49 tracking head trainer, and practices aiming the M49 at a stationary IR source.

PERIOD 6 - During this period, the trainee is given a further explanation of the operating procedures of the Redeye weapon, tracking head, and simulators. He is then given an opportunity to engage targets using the M49 and the M46 field handling trainer, he is given a quiz on all previous instruction.

PERIOD 7 - During this period, the trainee receives instruction on the Redeye's capabilities and limitations. This includes a discussion of the infrared seeker and missile performance capabilities.

PERIOD 8 - During this period, the trainee receives instruction on tactical engagement procedures and technique of fire. He then goes through a series of practical exercises engaging targets that are presented on the moving target simulator (MTS). He uses a slightly modified M49 tracking head trainer to acquire, track and fire at the targets. The MTS consists of a 40 foot hemispherical screen on which a moving target image is projected. This simulated environment has been carefully scaled for realism, to include various target types, sizes, speeds, and flight tracks. Present target programs consist of eleven reels of film, each containing twenty target runs which are projected on the simulated sky background. Target sound effects are also employed to add realism. Twenty different types of aircraft are presented. The programs are designed to develop proficiency in a progressive order of difficulty Target course, speed,

maneuver, and range are systematically varied in the different programs.

The gunners are faced with the problem of determining which of six types of aircraft they have detected (large and small: jets, propellor and helicopter types) and then judging by the size of the aircraft in his sight whether to activate the weapon, hold their fire, resume firing, or cease firing. The decision to hold fire or resume firing is based on the weapons capabilities and limitations as listed in FM 23-17A (C). A small card listing plane sizes, ranging from $\frac{1}{4}$ to 6 times the size of the sight ring, is issued to the students to provide guidance on when they should activate, hold resume, or cease fire.

Two trainees track on the MTS at one time, each one assisted by a coach. An IR spot projected coincident with the target image on the screen provides an IR source that can be acquired, tracked, and locked on by the seeker head in the M49. An error indicator mounted on the front of the M49 provides feedback on whether the trainee has performed all steps correctly or if an error has been made at a particular point in the firing sequence. Each trainee conducts approximately 156 trials during the 26 hours of practical exercise in this period. The trainee also performs as a coach 156 times and observes other trainees perform the rest of the time. While observing, trainees are given optical sights from previously fired XM41 El Redeye missiles to practice tracking the projected targets.

The MTS is an excellent training device that provides an opportunity for practical work in all phases of gunner training. This includes aircraft identification as targets were generally types of Soviet aircraft that the trainees were asked to identify. There are four of the MTS at Fort Bliss, one at Fort Bragg and it is understood that films call for building one MTS each at Forts Riley, Lewis, and Carson, and several in Germany.

PERIOD 15 - During this period, all previous instruction is reviewed and the trainees are given a final written examination. The examinations are graded as they are turned in and a critique is then provided to clear up any weak points noted. Trainees must have a minimum of 70 percent to be awarded the 6R suffix to their MOS indicating that they are qualified Redeye gunners.

PERIOD 16 - During this period, the trainees are taken to the range area to observe the firing of the two Redeye missiles allocated to each class. The four top students go to the firing line while the rest of the trainees observe from the stands nearby. The ballistic serial target system (BATS), a 300-to-450 knot target with an IR source is fired in a crossing pattern some distance out from the gunners. The gunner attempts to acquire the target and fires if he thinks he is on-target. While he is firing, the other gunners practice tracking with the M49. The gunners are rotated and additional BATS fired until the two Redeye missiles have been fired, e.g., four BATS were fired in the range firing observed. The firing is then critiqued by an instructor.

PROFICIENCY MEASUREMENT

END OF COURSE EVALUATION

Performance Measures. The last two of the eleven MTS target film programs contain a selected mix from previous programs and may be used for examination purposes. The trainee is expected to perform without error on these test runs. Discussion with the instructors indicated that the proficiency test criteria are not actually utilized. Instead, trainees who make the most errors during training are given additional trials in order to bring them up to desired standard and attempt to insure errorless performances by all trainees.

Performance Standards. By the end of their training, students are expected to perform without error, all of the steps in firing required of a gunner to successfully fire a Redeye missile at an appropriate target.

Periodic and final written examinations are also given the student to insure adequate knowledge of the weapons capabilities, methods of employment, rules of engagement, and similar information. A grade of 70 percent is required for successful completion of the course.

Validity of Performance Measures. Since only two trainees per class have an opportunity to fire an actual Redeye missile, there is no sure way to confirm that trainees have the level of proficiency required for combat. The purpose of the course is to qualify them in all phases of gunner training and the testing procedures insure them proficiency when not under stress. The instructors feel that overall proficiency has deteriorated somewhat due to the deletion of live aircraft tracking training. They point to recent Redeye missile firing (50% hit rate) as an example.

REDEYE UNIT TRAINING

In an attempt to obtain information on Redeye Unit Training, individuals from a Redeye Section assigned to a Cavalry Squadron of a Cavalry Regiment were contacted. In questioning the First Lieutenant, Section Leader, and Sergeant E5 NCOIC, it was determined that they were conducting very little Redeye training. Although they have personnel and equipment assigned to their section, they are usually involved in other duties and have participated in Redeye training only a few days in the last five months.

They were currently using the MTS and M49 training devices to give refresher training to gunners in preparation for an impending Squadron ATT. They did not know what would be required of them on the ATT.

The section did have seven $\frac{1}{2}$ ton trucks and trailers and five drivers that were usually assigned other tasks. The section had four makeshift field trainers that were previously fired Redeye rounds. They were authorized an M49 tracking head trainer but they did not have one as they did not have the required classified storage space for it.

The Sergeant had been in the Redeye Section of a Cavalry Regiment in Germany for two years prior to his current assignment. He found the situation quite similar to his present one until training test failures brought on more emphasis.

Neither of the individuals had seen a copy of Army Subject Schedule 23-17 and they were not familiar with the 264 hour training program prescribed for Redeye Sections. The Fort Bliss Redeye instructors said they had trained some individuals from tactical units and were under the impression that some training is being conducted at unit level in certain divisions.

Table H-1

Description of Redeye Training

Applicable Instruction		Scope or objective of period	Percentage of period conducted with C,D, or PE	During each PE; number of training trials per student per position	Use of training devices, live fire, mock-ups, or hand-on during PE
Period	Hours				
1	1	Introduction to Redeye Missile System	100%-C	0	N/A
5	3	Principles of Redeye Operations	33%-C 33%-D	10 per student, others coach or watch	TD(M49 aimed at stationary IR target)
6	4	Operating procedures of Redeye weapon, tracking head, and simulators	25%-C 50%-PE 25%-Ex	20 per student, others coach or watch	TD(50%-M46, 50% M49)
7	1	Redeye capabilities and limitations	100%-C	0	N/A
8	30	Technique of Fire and Engagement of Targets	13%-C 87%-PE (C-4 hrs, PE-26 hrs)	6 per student per PE hr or 156 trials. Also coach 156 times & watch rest of time	TD(M49 aimed at targets on M87 MTS)
15	3	Examination	33%-C 33%-Ex 33%-Cr	0	N/A

Table H-1
(cont'd)

Applicable Instruction		Scope or objective of period	Percentage of period conducted with D,D, or PE	During each PE; number of training trials per student per position	Use of training devices, live fire, mock-ups, or hand-on during PE
Period	Hours				
16	2	Range Firing	100%-PE	Top students fire two Redeye at BATS - others watch	TD(M49 to practice), HO (fire M41E2)
Totals	44		C-9 hrs PE-31 hrs Ex-2 hrs D-1 hr. Cr-1 hr.		TD's M46-2 hrs M49-31 hrs M87-26 hrs 59 hrs LF-2 hrs *Total 61 hrs

*Exceeds period hours as TD's were often used simultaneously.

Table H-1
(cont'd)

Applicable Instruction		Desired changes in the course in terms of increases, decreases, additions, or deletions	Type of feedback or critique given to the student	Provisions for slow students (recycle, etc.)	Passing or qualification score, type of measure, indication that objectives have been achieved	Have the periods been sequenced or scheduled in a manner which interferes with training
Period	Hours					
1	1	None	None	None	N/A	No
5	3	None	Mistakes noted on M49 and critiqued by instr.	Same as above	70% required on written exams and observed performance	No
6	4	None	Instructor critiques PE errors and quiz	Same as above	Must be making 70% to stay in course	No
8	30	Substitute live target tracking and use of RELS for some of MTS hrs to add interest	Instructor critiques performance	Additional trials, special attention by instructor & study halls	Must maintain 70% average & perform proficiently on trainer	No
15	3	None	Exam graded immediately & critiqued	No recycle for failures	Minimum of 70% or no 6R added to MOS	No

Table H-1
(cont'd)

Applicable Instruction		Desired changes in the course in terms of increases, decreases, additions, or deletions	Type of feedback or critique given to the student	Provisions for slow students (recycle, etc.)	Passing or qualification score, type of measure, indication that objectives have been achieved	Have the periods been sequenced or scheduled in a manner which interferes with training
Period	Hours					
16	2	Add RELS for range phase	Firing critiqued	N/A	N/A	No
Totals	44					

Summary of Training For Redeye Gunner

1. The attached form provides a detailed summary of that portion of the 83-hour Redeye Gunner Training Course that is concerned with the gunners' ability to acquire an aerial target and successfully engage it with a Redeye.
2. In arriving at the number of trials per student in training situations, the current average of 50 students per class was used. An increase or decrease in the number of students would, of course, change this figure. Only one position (standing) was used in the Redeye training.
3. To insure understanding the abbreviations, and weapons, or device types used in the summary are explained below:
 - a. IR - infrared.
 - b. BATS - ballistic aerial target system.
 - c. M41E2 - Redeye missile.
 - d. M46A2 - field handling trainer.
 - e. M49 - tracking head trainer.
 - f. M87 (MTS) - moving target simulator.
 - g. RELS - Redeye launch simulator.
 - h. Types of instruction:
 - C - Conference
 - PE - Practical Exercise
 - D - Demonstration
 - Ex - Examination
 - Cr - Critique

1. Practical Exercise using:

HO - hands-on equipment

TD - training devices

MU - mock-ups

LF - live fire

4. The period numbering system is coordinated with the numbers listed for periods in the attached Redeye Gunner Course POI, dated 2 July 1973.

AIR DEFENSE
DESCRIPTION OF AIT WEAPONS TRAINING
FOR THE CHAPARRAL

INTRODUCTION

DESCRIPTION OF WEAPON SYSTEM

The Chaparral is a self-propelled, surface-to-air guided missile system designed to protect the forward battle area against hostile aircraft operating at low altitudes. It consists of three basic parts: the launching station (M54), which may be mounted on or operate separately from its carrier; the six-ton full-tracked vehicle carrier (M730); and the Chaparral missile (MIM-72A), a supersonic, surface-to-air missile that uses passive infrared target tracking.

The launching station mount consists of a gunner's compartment with a plexiglass canopy located between two pairs of missile launcher rails. The mount can be traversed 360 degrees in azimuth and the launch rails can be elevated thus permitting the movement required for target acquisition, tracking, and firing. The launching station carries 12 missiles, four on launch rails and eight in storage compartments in the tracked vehicle carrier. Located in the base structure and the mount are components comprising seven functional subsystems: power, mount erection-subtraction, mount drive, missile control and launch, missile air, environmental control, and communications. These are used in preparing the weapon system for firing and firing.

The MIM-72A Chaparral missile is 9.5 feet long, 5 inches in diameter, and weighs 190 pounds. The guidance section, located at the forward end of the missile, senses the IR radiations of the target and generates signals that direct the missile to target intercept. The guidance section also produces an audio signal that informs the gunner that the targets IR radiations are being received. The

missile's target detection device (TDD) functions as a proximity fuze. It also provides signals that cause destruction on contact or self-destruct. Since the Chaparral does not have sophisticated electronic sensors and identification equipment, visual target detection and identification are required to accomplish its mission. This, of course, limits Chaparral operations to periods of good visibility.

The gunner operates the system by pointing the launching station mount at a visually acquired aircraft target, tracking the target to maintain an on-target infrared tone which indicates that the infrared seeker head in the missile has acquired the target, and then pressing the firing trigger when the target is within the engagement envelope. Once fired, the missile is beyond the gunner's control and depends upon the target's infrared radiations to generate guidance orders.

TACTICAL MISSION

The mission of the Chaparral battery is to provide air defense for forward combat elements, areas, or installations against low-altitude, hostile aircraft. Chaparral units may be assigned one of four standard tactical missions: general support, general support-reinforcing, reinforcing, or direct support. Chaparral units are most effective when employed in an area defense pattern to provide sufficient air defense for ground combat and combat support units and installations. The weapons are deployed forward and along likely low-altitude avenues of approach. Chaparral units may also be employed to defend large vital areas and march columns from positions along the route of movement.

CURRENT ARMY ORGANIZATION OF WEAPONS AND PERSONNEL

The Chaparral Battery is part of the Chaparral/Vulcan Air Defense Artillery (ADA) Battalion. The battalion has two Chaparral batteries and two Vulcan batteries. The Chaparral/Vulcan battalions are employed at division, corps, and field army level to provide defense against low-altitude aircraft. The battalion is organic to the

armored, infantry, and mechanized infantry divisions and is part of the division base. The Chaparral/Vulcan battalion may also be allocated to nondivisional units, such as ADA groups, brigades, or communications zone ADA organizations.

The Chaparral Battery has three firing platoons, each consisting of a platoon headquarters and four squads. Each squad is a fire unit. The platoon headquarters exercises direct control over the fire units. The platoon normally operates as an element of the battery, but may also operate independently. There are five men in a Chaparral squad: a squad leader, a senior gunner, a driver, and two gunner/observers.

TACTICAL EMPLOYMENT

Chaparral and Vulcan units are normally employed under the air defense "family of weapons" concept and compliment other air defense systems. Chaparral units are most effective when deployed in an area defense pattern, but may be used to protect vital areas or march columns.

Since the Chaparral Battery is normally dispersed over a large area, the battery headquarters is generally centrally located in order to control the platoons. Some important considerations in selecting positions are: good fields of fire and observation, accessibility, survivability, and communications.

When a Chaparral squad occupies a position, there are a number of tasks that various members of the crew have to perform to prepare the weapon system for operation. After they have performed these tasks, individually or in coordination with other crew members, they take up their operational positions. The senior gunner (No. 1) takes his place in the gun mount, the driver (No. 2) and an observer (No. 4) move out to a forward observation post, the squad leader and an observer (No. 3) move to a CP/OP location to the rear of the position with remote radio communications. The squad leader then notifies the platoon leader that he is ready. When a target is detected, the squad leader will direct the fire, but the gunner decides when and

if to fire based on the IR tone, the aircraft position in the launch envelope, etc. A typical fire mission might originate with an alert from the Chaparral battalion's forward area alerting radar (FAAR) which is displayed on the unit's target area alert data display set (TADDs). Or, the alert might come from one of the squad's observers. In either case, the squad leader would relay the information to the gunner and direct appropriate action.

TRAINING CONTENT

TASK ANALYSIS PROCEDURES

It is difficult to say that no task analysis has been conducted, but clearly no fully comprehensive one has been done on the Chaparral.

UTILIZATION OF MISSION PROFILES

No mission profiles have been reflected in Chaparral training.

AMOUNT OF TRAINING REQUIRED FOR PROFICIENCY

There has been no clear determination of the number of practice rounds required for firing proficiency. The amount of simulated firing practice has varied considerably in recent months depending on the type of training support available, e.g., live aircraft, model planes. Only one live round per class is being fired so this is more of a demonstration than practice since only one man fires.

TRAINING METHODS

This section is limited to a discussion of those periods of instruction that have direct application to some aspect of the firing sequence.

This is a seven-week (280 hours) AIT course of which 220 hours are MOS-related. Of the 220 hours, only 30 are directly related to some aspect of the firing sequence. Gunner Training is considered a small part of the course since the primary goal is to prepare the individual to perform as a crew member of a Chaparral squad. The four basic areas of instruction are the carriers, the launching

station, the missile, and communications. It is not anticipated that the trainee will be assigned the top crew position of senior gunner upon joining a unit. He may, however, be required to perform other duties, such as driver, loader, observer, and also be expected to communicate on the unit's radio. After much additional on-the-job training (OJT), he will probably have an opportunity to perform as a gunner.

Currently, class size varies from 5 to 15 and a new class starts every two weeks. There are three classes in session at any one time. The primary method of training has recently been changed to peer instruction. Most of the practical exercise periods in gunner training and 154 of the 220 total hours devoted to MOS training use the peer instruction method. After training, an individual must perform the designated task correctly before he can go on to the next phase (pass/fail procedure). Tests are administered by someone other than the individual who gave the training. As a trainee proceeds through the course, he is in one of the following categories, generally in this sequence: observer, skill acquisition, job performance, peer instructor, and course administration. Instructors are enthusiastic about the change to Peer Training as they feel it has increased interest and produced better results.

Until July 1973, trainees were taken to a range to practice tracking an F-100 and a B-57. However, recent fuel shortages have completely curtailed this program. As an interim measure, trainees were taken to an area near El Paso International Airport where they practiced tracking targets of opportunity. Current training uses a radio-controlled model aircraft as a target.

PERIOD 18. During this period, the instructor discusses various aspects of the M-54 launching stations to include: the nomenclature and location of major components, the location and function of panel and non-panel controls and indicators, and procedures for energizing and de-energizing the missile system.

PERIOD 19. During this period, the trainee is given an opportunity to locate the various controls and perform the procedures discussed in Period 18. This is accomplished on the actual equipment using peer instruction methods. When the trainee is considered ready, he is tested on a phase of the instruction and, if successful, is allowed to proceed to the next phase.

PERIOD 24. During this period, the trainee will practice appropriate procedures to prepare the missile for firing. This will again be peer instruction and the trainee will be tested on his performance.

PERIODS 28 and 29. During these periods, instructors discuss various aspects of air defense firing doctrine to include the following:

- a. Control measures - centralized, decentralized, and autonomous.
- b. Warnings - red, yellow, and white.
- c. Weapons control status - free, tight, and hold.
- d. Hostile target criteria.

The trainees are also familiarized with methods of weapons delivery and tactics used by aggressor aircraft.

PERIODS 30 and 31. During these periods, the instructor discusses the various rules of engagement, Chaparral firing technique, target acquisition, and engagement procedures. In roles of engagement, trainees are told of various conditions that control their firing. In the firing technique portion, the instructor discusses the decisions that must be made before firing on the target. The squad leader makes all command decisions, including designation of the target as hostile, selection of target to be engaged, and determining method of fire to be used. The gunner, however, must make the decision to fire if he thinks the target meets the technical requirements for a successful target engagement. Categories of targets and methods of engagement are also discussed in this phase. The steps in target acquisition are discussed to include: the initial visual detection by an observer and informing of the gunner

over the intercom, the gunner visually detecting the target and reporting CONTACT, the gunner acquiring and maintaining IR acquisition, the gunner adjusting the controls until he has an audible IR tone, and then announcing TONE over the intercom. The engagement procedures portion addresses the duties of all squad members as they accomplish the engagement tasks of: visual search and scan, target detection, target transfer to squad leader and gunner, target selection, target identification, engagement command, gunner visual acquisition, IR acquisition, fire decision, missile launch, and kill evaluation.

PERIOD 32. During this period, the trainees use the actual Chaparral weapon system with an M30 training missile to conduct target engagement practice. The M30 training missile has the same weight, number of components, and dimensions as the MIM-72 Chaparral missile series. The training round can be used for assembly, disassembly, and loading procedure training. It can also be used, as it is in this period, to track IR targets by replacing the inert guidance section with an MK 28 guidance section. The trainees use the actual equipment and attempt to acquire and track a radio-controlled model airplane. They are alternated on the equipment with about one-fourth of the training time being spent in the gunner's position. An IR source can be attached to the model planes. The GR-39 interrupter cable allows the instructor to monitor the IR tone obtained by a trainee and to prevent the weapon from being fired at his discretion. This latter feature allows the instructor to maintain safety during live firing on the range.

A device has been developed, the TSQ-T3, which provides the instructor with information about sequential errors made by the trainee in a practice engagement. It is a small box with error indicators that is attached to the system by means of special cables. However, there has been a delay in the manufacture of cables and the battalion has 8 or 10 of the boxes, but no way of attaching them to the weapon system.

PERIOD 33. During this period, the instructor teaches the duties and responsibilities of all squad members in various situations. In order to insure the timely and cooperative effort of crew members, a formal drill is prescribed. The squad members are numbered with the gunner being No. 1, the driver No. 2, and the two observers No. 3 and No. 4. Each squad member must know the duties and responsibilities of all other positions.

PERIOD 34. During this period, the trainees are formed into gun crews and go through the prescribed formal drill on the actual equipment. The trainees are rotated periodically and by the end of the period, they should have performed six times in each of the four crew positions.

PERIOD 43. During this period, the trainees are taken out to the range where the class observes their top student fire one Chaparral missile at a BATS target. The period is listed as being a practical exercise, but it is actually a demonstration for all but one member of the class. The demonstration sometimes has a negative effect as the inexperienced trainee-gunner misses the target.

The NCO Chief Instructor felt that the time and money allocated to this firing could be used for better purposes. He made the alternate suggestion that the three classes in session be provided one demonstration firing thus saving two missiles and insuring that all students observed a live missile firing. He does not think the "top student" firing is a great motivating factor and suggests that the firing be deleted. The time saved could be used for additional target engagement practice.

PROFICIENCY MEASUREMENT

END OF COURSE EVALUATION

Performance Measures. Prior to changing to the Peer Training system now being used, the battalion's Lesson Plan Index, dated 4 January 1973, indicated some formal performance test periods. Currently, the procedure is to let the trainee proceed through the course taking pass/final-type tests in various phases. These tests

are administered using detailed checklists to note correct or incorrect performances.

Performance Standards. The go/no go test is administered to the trainee by someone other than the individual that gave the initial training. If the individual being tested receives an unsatisfactory rating on any phase of the performance test, he must be given remedial training before being permitted to retake this test.

Validity of Performance Measures. For most crew duties, the procedure outlined above seem to be an adequate method of insuring an acceptable performance. However, there is presently no standard set for tracking proficiency. Tests of the trainee's ability to judge the engagement envelope are presently based on printed drawings of sight pictures. These tests do little more than examine the trainee's knowledge of the engagement rules and not his ability to apply those rules.

The instructors have discussed setting a tracking proficiency standard once the TSQ-T3 is operational. However, target samplings would still be restricted and uncontrolled. Present testing practices and standards are not considered adequate for estimating combat proficiency in this critical area.

CHAPARRAL UNIT TRAINING

In an attempt to obtain information on Chaparral unit training, a Chaparral Battery Commander and his training NCO were interviewed. They were unable to provide specific numbers of hours for types of training, but did offer to describe their general training situation.

They do have most of the personnel they are authorized. However, due to various requirements such as guard duty, post police, and maintenance, a small percentage of them are generally available for training. As an example, only 30 of 109 present for duty on the day of the interview were available for training. Since they are a STRAF unit and must maintain a high state of readiness, their

maintenance problem is particularly difficult. Due to funds which will reduce civilian guards on ammunition supply points (ASPs), they expect their guard problem to get worse.

In the face of these obstacles to training, they are attempting to accomplish essential training and maintain their unit's proficiency. They are not following the training program outlined in Subject Schedule 44-7, but are using it as a guide.

Their training emphasizes preparing for and firing the 12 live missiles the battery is allocated annually. This allocation is based on one missile for each of the unit's 12 squads. In order to provide for personnel turnover and maintain interest in training, the battery actually fires six missiles every six months. The training starts with a limited number of hours per week and gradually increases as the firing period approaches. This is done by coordinating on various non-training requirements with other elements in the battalion, particularly the Vulcan units. This frees Chaparral personnel for training and firing exercises in critical periods. Chaparral units must then in turn accept a larger portion of the support requirements when other elements of the battalion are in a critical phase.

The early training stresses crew drill to insure proficiency by all squad members. The emphasis is on training to correct weaknesses noted and developing improved SOPs based on the experience of unit NCO's. Firing practice often uses targets of opportunity in the area for tracking exercises, e.g., aircraft in the vicinity of El Paso International Airport.

The only training device used is the M30 training missile with the MK 28 guidance section replacing the inert section. This is used in the tracking practice described above.

Guidance on range procedures is provided by a battalion SOP. The other Chaparral battery fires during the same period so the two units can provide range support for each other. This includes many tasks such as firing the BATS, which is the target used. The battery commander felt they had done very well in some recent firing as the two batteries were credited with 12 combat hits with 12 rounds.

He does prefer a more realistic tactical situation for the firing, if possible. Presently, they know the expected direction of the target and other information that would probably not be available in combat.

Upon being asked if the FAAR or the TADDS were being used, the battery commander said they were not. The battalion does not have personnel or equipment for a FAAR unit. In their tactical training, they usually receive an initial alert from local sources and do not consider the FAAR capability.

Table H-2

Description of Chaparral Training

Applicable Instruction		Scope or objective of period	Percentage of period conducted with C,D, or PE	During each PE; number of training trials per student per position	Use of training devices, live fire, mock-ups, or hand-on during PE
Period	Hours				
18	1	Systems Operations	100%-C	0	0
19	12	Systems Operations	100%-PE	30 per student	Hands-On
24	2	Equipment Preparation	100%-PE	10 per student	Hands-On
28&29	2	Firing Doctrine	100%-C	0	0
30&31	2	Target Engagement Procedures	100%-C	0	0
32	8	Target Engagement Procedures	100%-PE	½ of time performing, observing the rest of the time	Hands-On in conjunction with training missile & MK 28 guidance section
33	1	Crew Performance	100%-C	0	0
34	3	Crew Performance	100%-PE	6 trials per 4 crew positions	Hands-On
43	8	Chaparral Firing	100%-PE C-6 hrs PE-33 hrs 39 hours Total	1 man fires, rest of class observers	Live Fire

Table H-2
(cont'd)

Applicable Instruction		Desired changes in the course in terms of increases, decreases, additions, or deletions	Type of feedback or critique given to the student	Provisions for slow students (recycle, etc.)	Passing or qualification score, type of measure, indication that objectives have been achieved	Have the periods been sequenced or scheduled in a manner which interferes with training
Period	Hours					
18	1	None	None	None	None	No
19	12	None	Peer Correction of errors	Additional Trials	Go/No Go	No
24	2	None	Peer Correction	Make up training on Tuesday nights	Go/No Go	No
28&29	2	None	None	Make up training on Tuesday nights	None	No
30&31	2	None	None	Make up training on Tuesday nights	None	No
32	8	Use a target simulator which provides movement & also allow the instructor to monitor the students' performance	Feedback missile tone when on target	Additional trials if needed	No evaluation possible other than see if gunner tracks smoothly	No

Table H-2
(cont'd)

Applicable Instruction		Desired changes in the course in terms of increases, decreases, additions, or deletions	Type of feedback or critique given to the student	Provisions for slow students (recycle, etc.)	Passing or qualification score, type of measure, indication that objectives have been achieved	Have the periods been sequenced or scheduled in a manner which interferes with training
Period	Hours					
33	1	None	None	None	N/A	No
34	3	None	Pass/fail check of positions	Additional training given	Pass/fail	No
43	8	Have one missile firing per three classes & use time for additional target engagement training	Critique after firing	None	None	No